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SURGICAL DIATHERMY IN LARYNGOLOGY*

GORDON B. NEW, M.D.
ROCHESTER, MINN.

In the treatment of new growths or benign lesions around the nose and throat, surgical diathermy is a valuable addition to the other well-known methods of treatment for local lesions. The selection of the best form of treatment for the various types of lesions, variously situated, is of the greatest importance, particularly for malignant lesions, when a combination of methods may afford the best results.

In reviewing recent literature on laryngology, one sometimes sees criticisms of certain forms of treatment of new growths. The treatment at times has been employed without due consideration of the type and situation of the lesion, and when the result is not good the method itself is held responsible. Surgery, diathermy, cautery, radium and roentgen ray all have their place in the treatment of such lesions, and only with experience can the proper type of treatment be selected in the individual case.

The work of Broders in grading epitheliomas, depending on their activity, has been the greatest advance that has been made in many years along this line. Treatment in cases of grade 1 epithelioma must be entirely different from that of grade 4. An epithelioma graded 4 is more like a rapidly growing sarcoma. While a patient with an epithelioma graded 1 may recover, regardless of nature of the treatment, the patient with an epithelioma graded 4 may die from general metastasis after the local lesion has been eradicated. Low-grade adenocarcinoma or fibrosarcoma presents an entirely different picture and requires different methods of treatment from the rapidly growing lymphosarcoma. In many cases, methods that are applicable to the pharynx should not be used in the larynx. It should be repeated, therefore, that the selection of the proper treatment for individual cases, all factors considered, is of the greatest importance.

THREE HIGH FREQUENCY METHODS

There are three methods of using high frequency currents in surgery; desiccation, coagulation, and the so-called radio knife.

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* From the Section on Laryngology, Oral and Plastic, Mayo Clinic.

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Desiccation affords just enough heat to desiccate and dehydrate tissues. The Oudin type of monopolar current is used. There is little inflammatory reaction, and the method is employed in cases of small, benign lesions.

By coagulation, or the bipolar method, larger growths and malignant lesions are destroyed. The operating table is covered with a large, thick rubber sheet. The larger indifferent electrode, a metallic plate, is covered with gauze, moistened with sodium chloride solution and placed underneath the patient's back. The active electrode may be small needles or blunt points, sometimes called buttons. All but the extreme point of the long needles are covered with rubber when used in the larynx. I have used both types of active electrodes. The needles carry the heat deep into the tissue, while the buttons or blunt electrodes allow the heat to penetrate from the surface. The current may be controlled by means of a foot switch or a thumb control. The active electrode is not hot and only the part touched with the electrode is coagulated. Protection of the surrounding tissue is not as essential as with other forms of cautery. The destroyed tissue may be removed with a cutting cautery or a curet. If one is working on the surface of bone, the tissue ultimately becomes dry, and sparking occurs. The patient will complain of pain at this time, and a little water is used to moisten the area treated.

My experience with the radio knife has not shown it to be superior to the cutting cautery.

ADVANTAGES OF DIATHERMY

The advantages of diathermy over the other forms of cautery are: (1) it is not necessary to protect the tissues around the area treated; (2) there is no bleeding during the operative procedures; (3) the active electrode is easily carried into the nose, pharynx or larynx, without burning any areas except those treated; (4) local anesthesia with gas may be employed if necessary, and (5) sterilization is effected by the heat being brought from the depth of the tissue; thus the wounds are cleaner.

The disadvantages are: (1) the fact that the destruction, which varies according to the size of the patient and the size of the electrodes, is much greater than appears at the time of the operation, and (2) the possibility of secondary hemorrhage; it is questionable, however, whether this is any more likely to occur than with other types of cautery.

Diathermy seems to be particularly adapted to angiomas in adults. Formerly, we buried radium in the tissue. In infants, the radium is very satisfactory, in the adult, however, the method is very slow and unsatisfactory. In the destruction of benign and malignant lesions in the nose, a small point may be carried directly to the site of the lesion without burning other tissue, as in controlling bleeding of the septum or

destroying small polyps of the nose. It is very satisfactory for destroying synechia of the septum, as there is less reaction than with a cautery.

In England, diathermy has been employed for the destruction of areas of lupus in the nose and throat; only a few such cases have been seen in the clinic. For the treatment of leukoplakia or areas of thrush about the mouth, it is of value. For papillomas of the larynx in adults and in children, the results so far in most cases have been satisfactory.[1] In the treatment of malignant tumors about the nose, sinuses and jaws, it has almost entirely replaced the other forms of cautery; in the latter conditions, diathermy and radium are frequently combined. In cases of low-grade malignancy, diathermy is the usual treatment, while in cases of more active epithelioma and lymphosarcoma, radium is usually depended on to destroy the growth. The same is true of the pharyngeal lesions, radium being employed for the more active epitheliomas and sarcomas, and diathermy for some of the low-grade lesions.

Radium has been used in cases of nasopharyngeal malignant tumors, because most of the epitheliomas are of grade 4 malignancy, and the lymphosarcomas respond better to radium than to any other form of cautery. Excellent results have been obtained from the use of radium in cases of fibroma of the nasopharynx. However, diathermy might be used with equally good results and could be applied readily without injury to the surrounding tissue.

THYROTOMY, EXCISION AND LARYNGECTOMY

For malignant tumors of the larynx I prefer thyrotomy and excision, and laryngectomy. While thyrotomy with destruction of a small lesion with diathermy should give a satisfactory result, cases have been reported in which cartilage has been destroyed, and other untoward results have followed.

Novak [2] and others have reported on the use of diathermy for malignant laryngeal lesions either by suspension or thyrotomy. Personally, I prefer not to use diathermy or radium in the treatment of malignant tumor of the larynx. The permanent good results in all except a limited number of cases have been obtained by thyrotomy and removal of the lesion if it is small, and laryngectomy in the more advanced cases.

There seems to be less scarring following diathermy than with the other methods of cautery. This has been noticed particularly in cases of papilloma of the larynx in adults, and of malignant lesions around the mouth and pharynx. In all malignant cases, the glands of the neck

1. Hubbard, T., and Galbraith, E. G.: The Treatment of Papilloma of the Larynx by Fulguration and Diathermy, Tr. Am. Laryngol. Assn. **46**:111-122, 1924.

2. Novak, Frank J.: Carcinoma of the Larynx, Illinois M. J. **44**:338-341, 1923.

that drain the involved area should be removed in order to block the cervical extension. Usually, roentgen ray or radium is used first outside the neck; then the local lesion is taken care of, and later the cervical glands. A number of cases were observed in which the removal of the glands first resulted in a new lymphatic drainage, and metastasis occurred in a group of glands which ordinarily would not drain the primary growth. It is very difficult to expose the mouth or throat after resection of the glands, and this adds considerably to the difficulty of the operation.

CONCLUSIONS

Diathermy has an important place in the treatment of many lesions about the nose, throat and mouth. It may prove to be the best means of treating papilloma of the larynx in adults and possibly in children. Any one measure should not be emphasized to the exclusion of others until experience has proved its value.

CANCER OF THE LARYNX

J. E. MacKENTY, M.D.
NEW YORK

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PROGNOSIS

The results achieved in the arrest of cancer by surgery in this field far excel those obtained in any other part of the body. In intrinsic cancer, lymphatic extension is delayed for a varying period depending on the virulence and location of the disease. Starting, as a rule, on the middle of one cord, extension is, fortunately, forward and downward. So long as the arytenoids are free and the cartilage of the anterior commissure is intact, the prognosis is favorable. Posterior involvement is ominous in proportion to its depth and the degree of arytenoid involvement. Exceptions, however, occur frequently enough to make us apprehensive of the most incipient cases and not entirely hopeless of the most advanced. Several patients in my series with the larynx filled with cancer have survived the time limit, the worst one of all being still free after ten years. Two, with what appeared to be a small surface growth in the center of one cord, died of recurrence. To better elucidate this paradox, I subjected three patients with incipient cancer to total laryngectomy, and had the larynges carefully sectioned and examined. The results were given to the American Laryngological Association in 1923, and were, at least to me, most disconcerting. These cases were so early that thyrotomy seemed the just and logical thing to do. Under the microscope, two showed subsurface extension up to and into the angle of the anterior commissure. In the third, the subsurface lines went forward and backward, undermining the entire extent of the cord. These microscopic lines followed the lymphatics. Here a conservative operation would have been of no avail. This answers the question why some patients apparently with an incipient condition die of recurrence even after total laryngectomy. It is still a mystery why some patients with an advanced condition recover. Perhaps here a strong somatic resistance to the disease exists. It has seemed to me that the local infection, which occurs after practically all operations in this region, may have a deterrent effect on the extension of cancer.

It is a logical assumption from what has been before stated that the disease may be greater in extent than it appears, even after the most meticulous scrutiny. I have made it a rule to add two-thirds to the visible manifestation of disease in estimating its true extent, and on the judgment thus formed, to select the type of operation thus indicated.

In our present state of ignorance on cancer, we can offer the patient only one avenue of escape, and that is through surgery sufficiently radical

to insure a thorough circumvention of the disease. Laryngectomy assuredly offers greater security than thyrotomy though much greater disability. Secondary operations have, at least in my hands, been futile. As in other surgical fields, one chance only is given to cure cancer. If our leaning is too much in the direction of conservatism, the patient must often pay with his life. An early recognition of intrinsic cancer is a crying need, and would, with the patient's consent to operation and the elimination of the lure of radium, bring about, I am convinced, a high percentage of cures.

TREATMENT

Radium.—Since about 96 per cent of laryngeal cancers are squamous celled and consequently highly malignant, it is reasonable to expect that radium would fail here even more conspicuously than it has failed in the same type of cancer in more accessible regions. Arrests have been observed in the less malignant types, such as epithelioma and adenocarcinoma. An occasional report of the arrest of the squamous type is not wanting to keep alive a treatment which cannot compare in its results with surgery. We have all been witnesses of many victims lulled to eternal sleep by the siren song of the radium devotee, who will not or who cannot realize the limitations of radium. Many patients with incipient cancer pass out of my hands into the radium laboratories, and return too late for surgical help. A serious feature of radium treatment, in incipient or in doubtful cases, is that its reaction obscures the clinical picture, making it impossible to estimate the extent of the disease or to complete the diagnosis. Radium may produce a marked surface recession of the disease even to its apparent disappearance. On its reappearance the same reaction may be brought about by radium but to a less marked degree; and so on, until complete radio resistance is established. In the meantime, the disease has been stealthily moving toward the cervical lymphatics.

In one illuminating incipient case, radium emanations were injected into the growth, with an intense reaction causing necrosis of the interior of the larynx. A virulent general and local septic reaction followed, with a daily temperature rise to 103 F. Body weight was reduced from 217 to 115 pounds. The larynx was removed four months after the application of radium. It had been changed by radium and sepsis into a shapeless mass with a fetid abscess in its center. The walls of the abscess cavity showed typical cancer areas. The intense dose of radium failed to kill even this incipient growth. The patient made a good recovery and is free from recurrence after eight years.

The inaccessible situation of cancer in the larynx makes radium application difficult and uncertain. If the patient cannot be dissuaded

from its use, then I would strongly urge that the larynx be widely opened and retained open until the treatment is concluded. To accomplish this more safely, a tracheotomy must accompany the laryngofissure. In this way, the true status of this method of treatment could be determined once and for all and adopted or discarded on the results obtained. Our present hesitant attitude, to my way of thinking, is criminal in the face of a menace so terrible.

Radium, I believe, has an important field in postoperative treatment. In all but the incipient cases, I advocate thorough irradiation of the area operated on, and of the neck on either side. This should not be begun until the cicatrization of the wound is fairly well organized, since radium tends to melt young fibrous tissue.

Hemilaryngectomy.—This operation, once so popular, has, owing to its high mortality and low percentage of arrests deservedly fallen into disuse.

Window Resection of the Thyroid Cartilage.—Years ago, I experimented with this method, and found that it gave more recurrences than thyrotomy. It seemed to open the neck to invasion. We now realize that cartilage involvement points to only one procedure, namely, total laryngectomy.

Laryngectomy.—This is a crowning achievement in the annals of surgery. Handicapped by an all but prohibitive mortality and a discouragingly high percentage of recurrences, it has, after seventy-five years of devoted and obstinate effort, finally come forth, well-equipped technically, and with its underlying principles thoroughly worked out. This slow development, contrasted with the rapid perfecting of other general surgical procedures, is comprehensible when we consider the many technical difficulties which beset its path. Many of these were not soluble on general surgical grounds, hence the conspicuous failure of the general surgeon in his efforts to cope with this problem. Belated attack, a technic too crude for this finer work, a prohibitive surgical mortality and few ultimate cures were the obstacles in the way. On the other hand, the specialist, although better equipped than the general surgeon in the art of diagnosis and in the surgical needs and dangers of the operation, lacked the general surgical experience to materially better the outcome. The recent phenomenal growth and complexity of our specialty has made imperative a more exact and practical knowledge of general surgery than was even dreamed of twenty years ago.

This coalescence of general and special surgery has brought about many fruitful results in the whole field of laryngology, and notably in that section of it under discussion.

To those interested in the multiple stage operation, I shall present the well known names of New and of Crile [13] as worthy exponents of this method, and shall confine myself to a description of the one stage operation, its principles, technic and after treatment.

To the genius of Gluck [8] perhaps more than to that of any other man, does this operation owe its greatest impetus. He did more than any one before or during his time, to place the one-stage operation on a firm basis. Sixty-three consecutive total laryngectomies were reported by him without a surgical mortality. In other hands, this remarkable showing was not duplicated, and the surgical mortality continued high and out of all proportion when compared with other major surgical procedures. To circumvent this, the multiple stage operation was put forward and was at once adopted by many operators. Little effort was made to complete the great work begun by Gluck.

Starting with the one-stage operation eighteen years ago, I have steadfastly adhered to it and have brought it out of its difficulties to a point at which it may be favorably compared with its rivals. The one-stage operation has always appealed to me since the tendency in general surgery, which I had practiced for many years prior to entering laryngology, was and is, toward dealing with any given disease by a single effort. The misery to the victim is surely minimized by so doing, providing the single effort can be shown to be as safe as its multiple substitutes. The multiple stage operation, so far as I have observed, has shown an indifferent cosmetic result at the trachea skin junction. Contraction of this opening necessitates the use of a permanent cannula. Over 80 per cent of the one-stage operations in my hands have given a noncontracting, open trachea which obviates the necessity of wearing a tracheal cannula, a result both gratifying and essential to the patient for the rest of his life.

When laryngeal obstruction is present, a two-stage operation is inevitable, since a preliminary tracheotomy must be performed to restore the equilibrium in the pulmonary circulation and to allay the concomitant bronchial congestion. Embarrassed respiration contraindicates an immediate laryngectomy. This preliminary tracheotomy is not, however, technically the two-stage operation set forth by those advocating it. In my own obstructed cases, a medium or high tracheotomy is performed with the object of excising later, with the larynx, the tracheal area through which the cannula passes, thus returning to the one-stage operation in all its essential details. The aim is to secure a fresh healthy tracheal stump for union with the skin.

The technic, to be briefly outlined, went through many stages before experience dictated its present form. In the earlier subjects, convalescence was often slow, local infections were sometimes extensive and

plastic procedures were frequently necessary. In the later years, convalescence has been cut in half, infections rarely troublesome and only minor plastic closures indicated. Usually in three weeks or less the patient is able to take food by mouth, which means that the hypopharynx has closed.

The unusual success which has crowned our efforts, is due to accepting for operation only intrinsic cases; to rejecting bad risks, and to following the principles which I shall now enumerate under eleven headings:

1. A careful study of the patient's general condition and of the metabolism, especially as shown in the blood chemistry. Patients with pronounced and irremediable metabolic imbalance are rejected.

2. Digitalization just prior to the operation in all patients in whom cardiovascular degeneration is suspected.

3. Careful dieting and colonic lavage for at least one week preceding the operation.

4. Mouth hygiene. The extraction of all diseased teeth and the treatment of diseased gums. Practically all mouths are unclean at the age at which cancer occurs. The entire absence of teeth is a distinct advantage.

5. The combination of local and general anesthesia, the latter not to exceed one-half hour in time.

6. The absolute exclusion of blood from the trachea during operation, and of wound drainage after operation.

7. The placement of wound drainage so as to block off extension of the infection into the planes of the neck and the special management of this drainage during the convalescent period.

8. The anchoring of the trachea in the lower angle of the wound, and the corking of the trachea to exclude wound drainage during the entire convalescent period.

9. The use of suction for wound cleansing and for clearing the trachea of secretion. Inspissated secretions sometimes lodge at the tracheal bifurcation causing serious embarrassment to respiration. These should be removed with the bronchoscope.

10. The use of the naso-esophageal feeding tube extending only half way down the esophagus. This secures a liberal diet from the start.

11. The dressing and care of the wound should be done by the surgeon himself and not by an assistant or staff physician, probably untrained in this work. All one's experience in the handling of infected wounds is required in forestalling a serious septic invasion.

THE SURGICAL PERIOD AND TECHNIC

The surgical period may be divided into three stages: (*a*) The preparation; (*b*) the operation; (*c*) after treatment.

The Preparation.—Several years ago, observing that the outcome depended largely on the patient's general condition, I began a careful inquiry into cardiovascular status and metabolism. It was found that hyperglycemia was a serious menace. Even now with insulin and a better understanding of the diabetic state, the danger is only partly removed. All patients are prepared by a metabolist who endeavors to restore the metabolic balance.

Cardiovascular degeneration, if not too advanced, does not contraindicate operation. The exhibition of digitalis may be of great value and, if employed, should be completed just before the operation. I would caution against over digitalization, as it is extremely dangerous during any prolonged operative strain. One of my patients was nearly lost through this error.

Special attention is paid to diet and a thorough cleansing of the colon. During the week preceding the operation, three colon irrigations are given at two day intervals. Before the first one, castor oil is indicated and eggs and milk are excluded from the diet.

All carious and pyorrheal teeth are extracted and the remaining ones are cleaned. The entire absence of teeth materially lessens the danger of wound infection. Morphine, ¼ grain (16 mg.), and atropine, $\frac{1}{200}$ grain (0.3 mg.), are administered hypodermically one hour before the operation. Old and feeble patients are given a few days rest in bed prior to the operation.

The Operation.—The combination of local and general anesthesia is, in my opinion, better than one of these alone. By this method, the duration of the general anesthetic is reduced to one-half hour, an important factor in the resistance of the patient. A satisfactory regional anesthesia may be secured with 0.5 to 1 per cent of procaine and epinephrine (10 minims [0.6 cc.] to the ounce). One ounce or less is required. One per cent is used for the skin and a few deep injections around the trachea, larynx and in the course of the superior laryngeal nerves; 0.5 per cent suffices in the deeper parts during the operation (fig. 1). Paravertebral anesthesia gives an extensive, complete and lasting anesthesia when successfully applied, but its dangers offset its advantages. Under regional anesthesia, the operation may, in many cases, if desired, be completed without resort to general anesthesia. But the tremendous nervous strain, even in the entire absence of pain, is a grave depressant and may be far more serious in its consequences than a short period of general anesthesia. The humane aspect must be kept in mind. Patients on whom I have performed the entire operation under local

anesthesia have told me that their mental anguish increased as time lengthened, and was especially acute at the period when they pictured the larynx being severed from the neck. Hence, I am strongly impressed by the beneficence of complete unconsciousness from the moment the trachea is bisected until the hypopharynx is closed. The patient remains

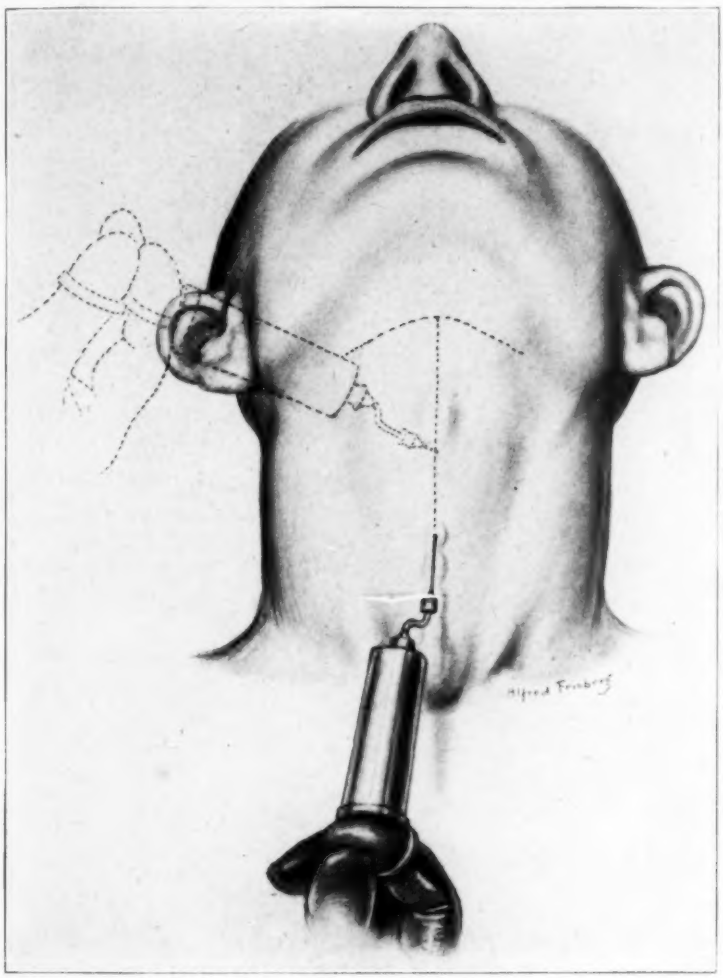

Fig. 1.—Method of inducing regional anesthesia. The syringe in dotted line carries the anesthetic into the deep tissues. The needle hugs the larynx and trachea closely to avoid the carotid sheath.

in a somnolent condition and free from pain during the completion of the operation without the further administration of ether or of procaine. Rectal anesthesia, enthusiastically advocated by some operators, has, in my experience, seemed dangerous and often inefficient. If the dose is

well on the side of safety, oral anesthesia has to be added. If large enough to produce complete anesthesia, it may carry the patient too close to the lethal border. I can see no way by which the dose can be accurately controlled or an individual idiosyncrasy foretold. General anesthesia through the entire operative period is dangerous, and should be avoided if possible. I believe that prolonged general anesthesia was one of the causes of the high mortality in the past. In a few of my patients who were extremely nervous, it had to be employed. The amount given should be reduced to a minimum and should be governed by the surgeon and not by the anesthetist. When the neoplasm

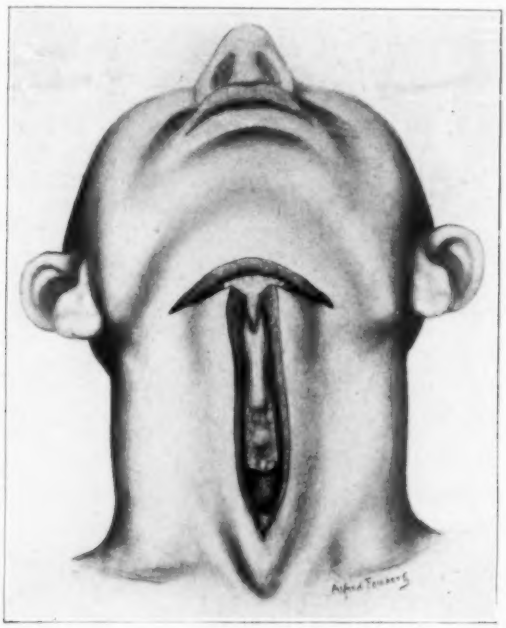

Fig. 2.—T-shaped incision, exposing the thyrohyoid membrane, thyroid and cricoid cartilages, bridge of thyroid.

encroaches on the breathway, the administration of general anesthesia from the start may increase the respiratory embarrassment and necessitate a tracheal opening before the surgeon is ready. Prolonged cyanosis or even a short acute attack predisposes to postoperative pneumonia, and should be relieved at once by opening the trachea transversally. This transverse incision does not mutilate the trachea and fits in with the scheme of the operation.

Through a T-shaped incision (fig. 2) the larynx is skeletonized and two rings of the trachea are exposed in front after dividing the bridge of the thyroid gland (figs. 3, 4 and 5). It is essential to the vitality of the

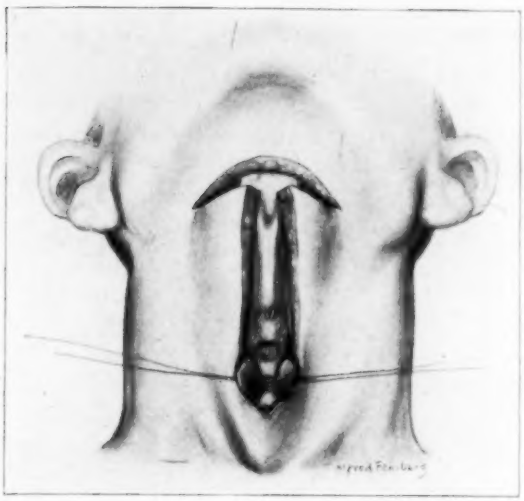

Fig. 3.—Thyroid bridge may be cut or retracted downward, depending on its position and size.

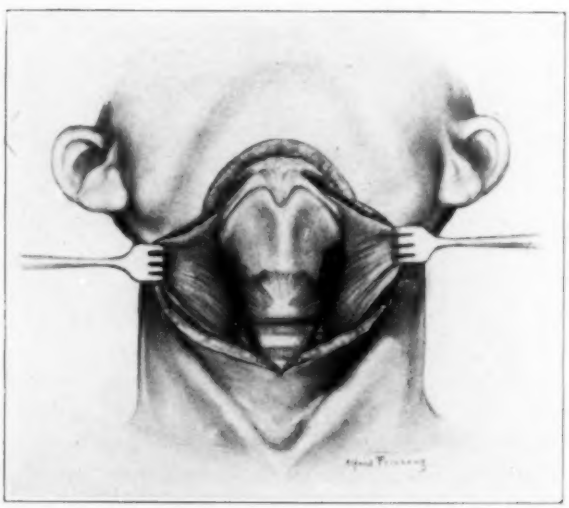

Fig. 4.—The larynx and one tracheal ring skeletonized.

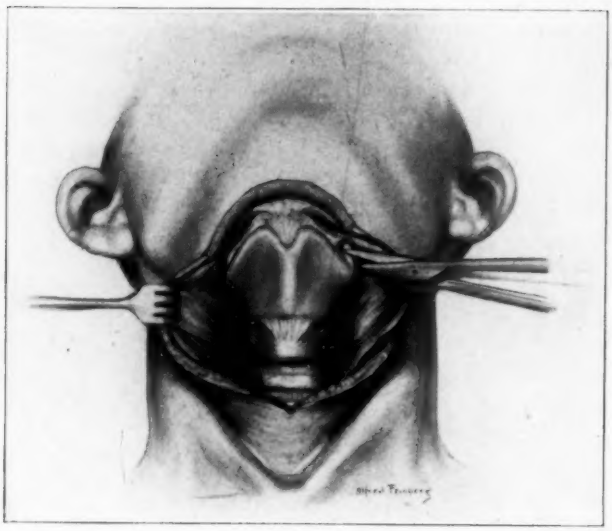

Fig. 5.—Cornu of the thyroid cartilage is cut close at its junction with the larynx.

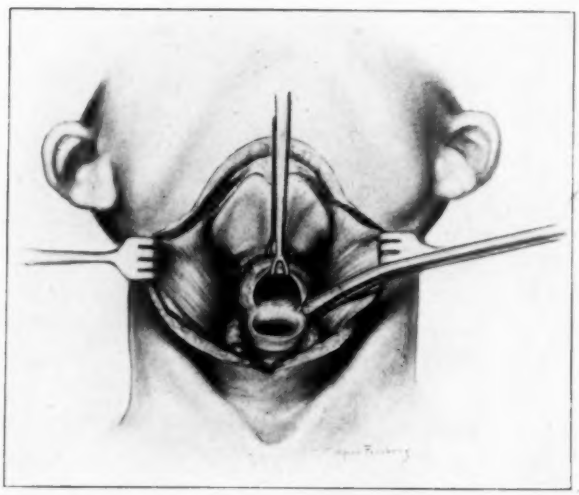

Fig. 6.—The trachea cut across. A mucus membrane flap is turned down from the posterior wall of the larynx (dotted line). The suction nozzle is put in to accentuate the importance of preventing blood from entering the trachea while it is being bisected and before the trachea extension tube is inserted.

exposed end of the trachea that it is not separated from its lateral and posterior attachments. All clamped vessels must be tied, the more important ones by transfixion. Much of the postoperative hemorrhage reported in the literature could have been avoided by conscientious attention to this detail. The smallest open vessel in the neck may bleed dangerously. When hemostasis is complete, a few drops of a 10 per cent cocaine solution is injected into the trachea to allay cough and to obtund the mucous membrane. The trachea is cut across below the cricoid, or lower if indicated, minute care being taken that no blood enters the lumen of the tube (fig. 6). A plug of iodine gauze is inserted into the larynx to wall off its infected interior. The trachea surrounding the opening is painted with a 1 : 200 solution of acriviolet. The larynx is lifted forward and the posterior tracheal wall is incised down to the esophagus. From a number of graduated rubber tubes, slightly cone shaped at one end, one which will fit snugly into the tracheal opening is selected, and is inserted to a depth of 2 inches (fig. 7). This acts as a tracheal extension, turns back the blood and enables the anesthetist to continue without being in the way.

The larynx is separated from the esophagus from below upward to a point behind the arytenoids, the degree of detachment depending on the extent of the neoplasm (fig. 8). It is then allowed to fall back into position and the thyrohyoid membrane is divided, thus opening into the hypopharynx below or above the attachment of the epiglottis as indicated by extent of disease. Before this is done, the anesthetist or an assistant opens the mouth, sucks out all the secretion, and paints the entire cavity, the pharynx and the hypopharynx with a solution of acriviolet. The nasal cavity is similarly treated. The edges of the opening in the thyrohyoid membrane are grasped and held apart. A yard of gauze folded 2 inches wide is stuffed into the hypopharynx and packed upward until it fills the hypopharynx, pharynx and mouth (fig. 9). At this point a careful inspection is made of the growth. If it is found to be entirely intrinsic, the larynx is removed by cutting as close as possible to the superior border of the thyroid cartilage. The opening thus made in the hypopharynx is small, and lends itself better to successful repair. If the disease has approached the top of the laryngeal box or has involved the arytenoid, then more tissue is sacrificed even to the removal of the anterior hypopharyngeal wall, adherent to the posterior surface of the larynx (figs. 10 and 11). In several cases, 1 to 1½ inches of the anterior part of this wall have been taken away with the larynx, without producing subsequent stricture.

Before the last stitch is tied in the closure of the hypopharynx, the anesthetist removes the gauze packing through the mouth. The pharynx and mouth are again cleansed by suction and painted with a solution of acriviolet. A feeding tube, of a size which will pass through the nose

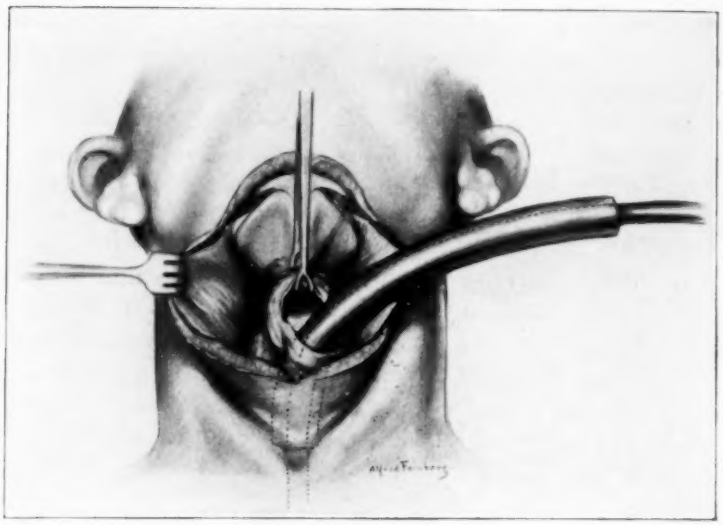

Fig. 7.—Tracheal extension tube and anesthesia tube in place.

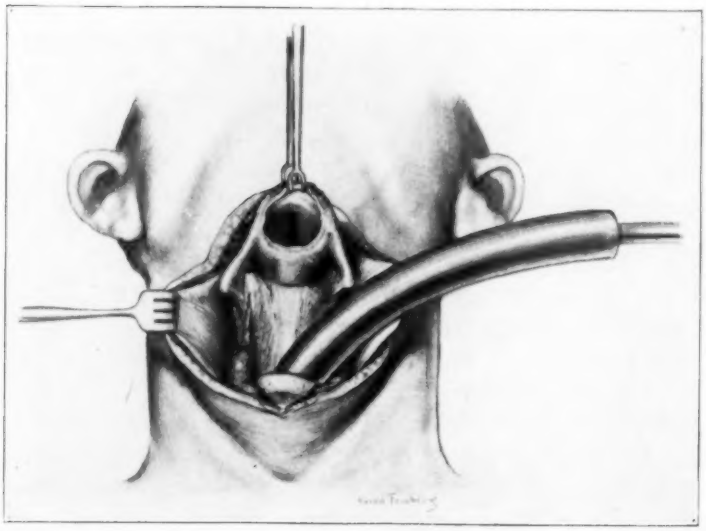

Fig. 8.—The larynx separated from the esophagus, up to the arytenoids. The exposed portion of the esophagus may be removed with larynx if the disease has invaded the arytenoids.

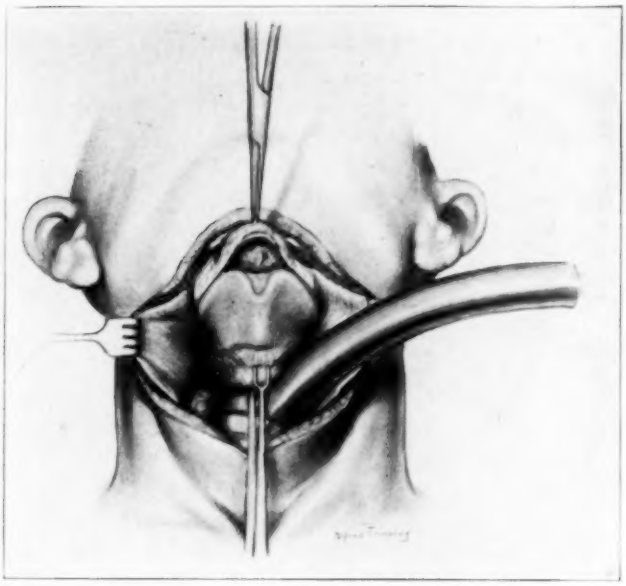

Fig. 9.—The larynx replaced. Thyrohyoid membrane incised, opening the hypopharynx. A strip of gauze long enough to fill the hypopharynx, pharynx and mouth is packed through the opening into these spaces. It shows at opening.

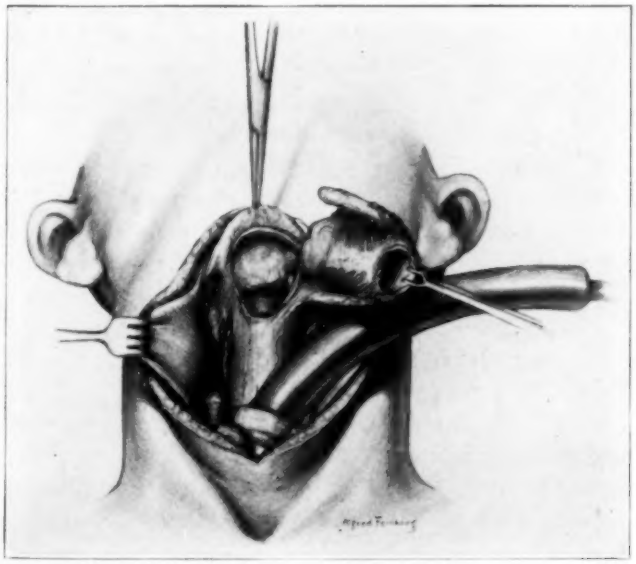

Fig. 10.—The larynx is almost removed. Opening in the hypopharynx. The size of this opening depends on the extent of the disease. In early cases, the dissection is carried as close to the larynx as possible.

without undue pressure, is introduced through the more open side. When its point appears in the esophagus, beneath the untied stitch, the surgeon directs it into the esophagus to a depth of 6 or 8 inches. The point of exit from the nose is carefully marked and the tube is secured to the face (fig. 12).

The last stitch is now tied. If the redundance of the tissue permits, a second layer of stitches is placed over the first in the hypopharyngeal closure. Number 1 or 0 plain catgut is used (fig. 13).

The trachea is anchored to the skin of the neck by one to three stay sutures, each passed around a ring and brought out about 2 inches from the edge of the wound. These are tied on small perforated lead disks. This steadies the tracheal stump in the wound and relieves the strain on the stitches which are to unite the skin edges with the mucous membrane of the trachea. These anchor sutures should not be retained after the third day, as they tend to become infected. To make this union more exact, the fat underlying the skin at the wound edges is cut away. This allows the skin to fall more easily into relationship with the rim of the tracheal stump. The skin and rim of the trachea are united by interrupted stitches, using fine silk, or better, fine Equisetene. The skin must well overlap the exposed rim of the trachea (fig. 14). The wound is loosely closed, no effort being made to bring the deeper parts into anatomic order. It is essential to get a primary union at one point—that is, where the two lines of the T cross. I have observed that if the integrity of this part of the wound can be maintained, the subsequent healing is much more rapid and a hypopharyngeal fistula does not form. If a break occurs at this point, or if the wound has to be entirely opened to secure better drainage, an effort should be made, as early as seems prudent, to bring back the angles of the T into place. A parallel mattress stitch is used in order to evert the edges and thus bring a more extensive raw surface into contact. In the event of loss of contact at these angles, a silver wire stitch is used to restore it. This may be done even during active infection and it usually succeeds. One other mattress stitch is placed between the trachea and the cross bar of the T, leaving ample room below it for the two lower drains. The wound is therefore closed with three stitches. In some necks five may be required (fig. 15).

I am convinced that an apparently negligible amount of blood entering the lungs during the operation may cause serious consequences. It is, therefore, my endeavor to conduct the operation so that not one drop is allowed to pass down the trachea. A double suction outfit in the hands of the assistants and meticulous vigilance on the part of all, secure this result. The rubber tracheal extension tubes are in five sizes, from which one may always be selected to fit the lumen of the trachea closely.

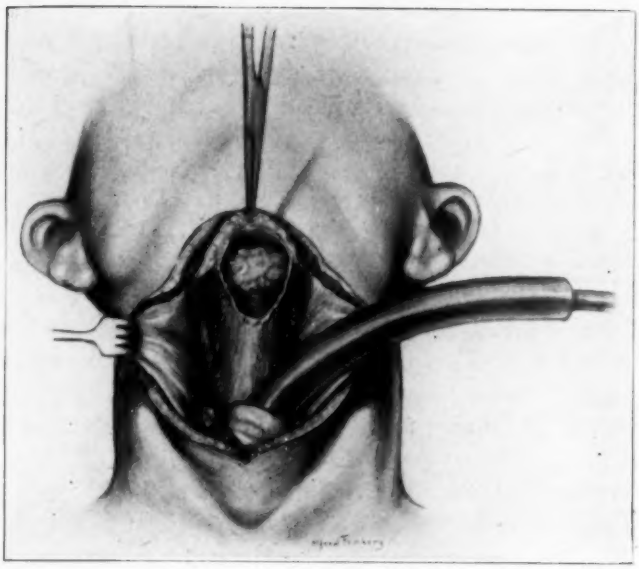

Fig. 11.—The larynx is entirely removed, showing defect in hypopharynx.

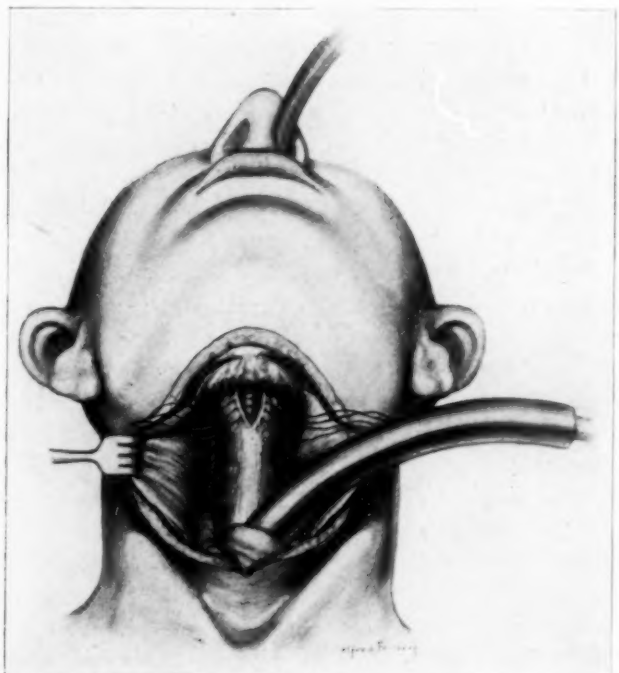

Fig. 12.—The hypopharynx is partly closed, leaving the lower stitches untied so that nasoesophageal feeding tube may be directed into the esophagus. Stitches in diagram fail to show the inversion of the mucous membrane edges.

Since I have put behind me the ambition of securing primary union, and have abandoned the usual surgical methods of wound closure with scanty drainage, my postoperative troubles have been materially reduced. Great care in closing the hypopharynx is essential, but, more essential to the life of the patient is a loose closure with abundant drainage of the superimposed tissues of the neck.

Septic infection must be forestalled by placing drainage in its path. My experience has led me to the following method: Four small double tube drains wrapped in gauze are used. The tubes are open only at their distal and proximal ends. One pair is placed in each pocket at the ends of the cross-bar of the T. Two are inserted into similar pockets just above the tracheal skin union and extend laterally to the full depth of the wound. The reason for this method of drainage will be explained later.

A large tracheal cannula (36) is wound round with gauze impregnated with bismuth paste (figs. 16, 17 and 18). The winding is so fashioned as to form a conical cork. This is inserted into the trachea and should fit it as a cork does a bottle. The object of corking the trachea is to prevent tracheal secretions from contaminating the wound and wound secretions from entering the trachea. It also protects the tracheal skin union. In my hands, it has been a serviceable device, especially later if infection occurs and discharge from the wound becomes profuse. Without tracheal plugging in the latter condition, lung involvement would be almost inevitable. The corking is maintained until healing is complete. The wound is dressed in the usual way. A rubber apron is placed over the end of the cannula to catch the tracheal secretions. The tracheal cannula is not disturbed for four or five days. It has been observed in a few patients that bismuth caused tracheal irritation. About the end of the first week, paraffin gauze is substituted for the bismuth.

After Treatment.—The immediate treatment usual after any major operation is carried out. I shall speak only of the conditions peculiar to this operation. It is here that the skill and experience of the surgeon are often taxed to and even beyond their limit, and painstaking constant care on his part is the only key to success. If infection occurs, the surgeon must be at least one step ahead of it. I attribute the prohibitive surgical mortality of a few years ago and even more recently to four causes, namely: careless selection and preparation of the patient, prolonged general anesthesia, the entrance of blood into the lungs during the operation and of wound secretions afterward and mismanagement of the local infection. Another factor may be added. Rectal feeding and drop feeding by the mouth were depended on prior to my demonstration, many years ago, that the esophagus would tolerate a permanent tube for weeks. Rectal feeding was one of the greatest fallacies that ever became rooted in the professional mind.

The drains are left in position, if possible, from five to seven days. If they are removed sooner, their replacement becomes almost impossible on account of the postoperative edema. This edema interferes with the replacement of the drains in their original positions. Pockets may form beyond their ends, followed by septic extension into the planes of the neck. On about the third day, cleansing of the drains begins. A suction apparatus is attached to one end of the double tube (figs. 19 and 20) and saline solution is gently forced through it emerging at the other end. This cleanses the tube. One end of the tube is now closed with a clamp and saline is forced through at the other end. The solution emerging in the depth of the wound and not finding egress through the clamped tube, is forced through the gauze surrounding the tube. Thus

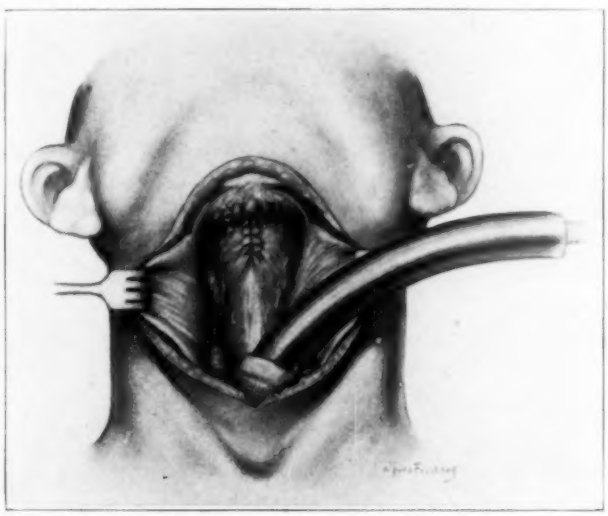

Fig. 13.—Hypopharynx closed. Note that line of union forms a T.

the gauze is cleansed. This procedure is repeated as often as seems necessary to keep the drainage active. At the lower end of the long arm of the T and below the mouth of the trachea there is always present a pocket which it is extremely important to drain. It is filled with loose gauze. The gauze should be kept wet and changed when it becomes blocked until walling off takes place.

The postoperative local reaction is sometimes considerable and may simulate infection. If doubt exists in the surgeon's mind, he would do wisely to extend his drainage openings as widely as possible, and keep a sharp outlook for extension along the muscular planes of the neck. If this occurs, these planes must be opened and drained. Later, if the discharge becomes excessive and if the hypopharyngeal suture line gives way, suction to remove saliva and pus is of inestimable value. Tubes

are placed at the bottoms of the pockets and through the opening in the hypopharynx. These project through the dressing so that the nurse may apply suction to them as frequently as is indicated. Surgical solution of chlorinated soda has been useless in this work since it may find its way into the trachea and cause intense irritation.

If, as sometimes happens, tracheitis follows the operation, suction applied through a catheter passed down the trachea unloads it of secretion and may prevent gravitation pneumonia. With the larynx gone, normal expulsive cough is impossible, hence the inability on the part of the patient to unload the trachea and bronchi. Here suction carefully and properly applied has, in my hands, saved many lives, not only in this operation but in all conditions in which the trachea is open and the

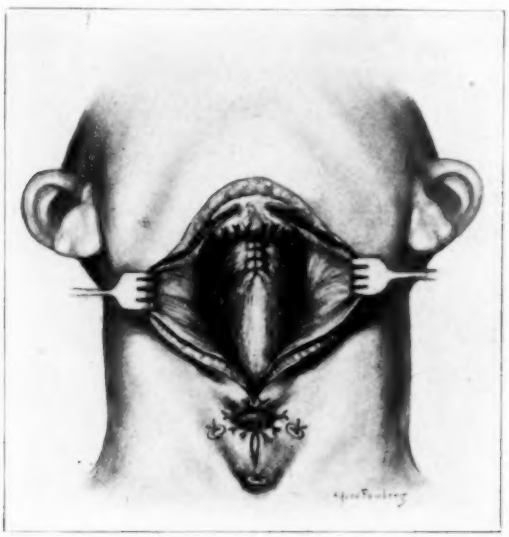

Fig. 14.—Tracheal stay sutures in place. Three are seldom used, more often one, sometimes none. This depends on the position of the trachea in the wound. In fat thick necks, the trachea must be drawn up toward the skin. The skin is brought over the rim of trachea and united to it by interrupted stitches.

bronchial tree blocked with secretion. On three occasions, a serious asphyxia was relieved by removing dried masses of secretion with the aid of the bronchoscope from the region of the tracheal bifurcation.

The permanent feeding tube is most helpful to these patients during the postoperative period. Nourishment to the point of tolerance discourages septic infection. Of what avail are the efforts of the surgeon against infection in a starving patient? For over twenty-five years, I have used this method of feeding without one untoward result traceable to it. Feeding is begun just as soon as the anesthetic period is over.

For two days, from one-half to two-thirds the caloric requirement is given, then the amount is increased to tolerance.

Any well-balanced diet capable of being reduced to a fluid or semi-solid state may be used. Fruit and vegetable juices are essential and are added after the second day. Gravitation serves for ordinary liquids; for the thicker ones the piston syringe is used. The patient being propped up in bed, the food is introduced slowly. After each feeding (which may be once in two and a half to four hours) a few ounces of water are passed through the tube to cleanse it. Several times a day the pharynx is cleared of mucus by suction and the mouth and teeth are cleaned with mouth wash and tooth brush. Dressings are changed as often as need be to keep the surface of the wound free from

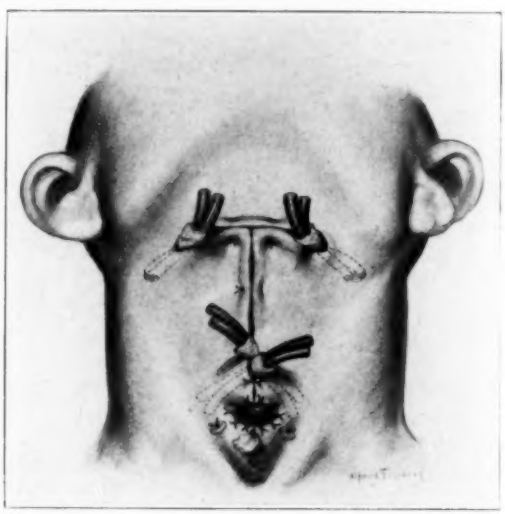

Fig. 15.—Five drains in place. The wound is closed by three or four mattress sutures.

secretion. The patient is shifted from side to side and encouraged to sit propped up in bed.

Extensive sloughing may be a blessing in disguise. I believe that it has, in several of my advanced intrinsic patients, been a determining factor in the ultimate cure by eradicating hidden cancer infection in the vicinity of the larynx.

Loss of speech is the serious drawback in total laryngectomy, and turns many patients toward radium and the less radical avenues of escape. I have many patients whose whisper can be distinctly heard at close range in a quiet room. Three patients operated on several years ago have acquired loud speech and can talk over the telephone. One can even count up to twenty on one stomachful of air. The technic of

this stomach speech is as follows: The esophagus is opened and the stomach is filled with air. Under control, the air is slowly returned to the hypopharynx in which guttural sounds are produced. This grunting sound is modulated into speech by the mouth and tongue. Several former patients are engaged in large enterprises, which they conduct as successfully as they did before their operation. Some have informed me that their stenographers can take their dictation with ease. They do not complain of discomfort during the cold months, not even in Canada. To protect the lungs against cold dry air, a bulging wire screen covers the tracheal opening and extends several inches down and across the chest next to the skin. Above this a high soft collar excludes the external air. The patient breathes the warm moist air coming from beneath

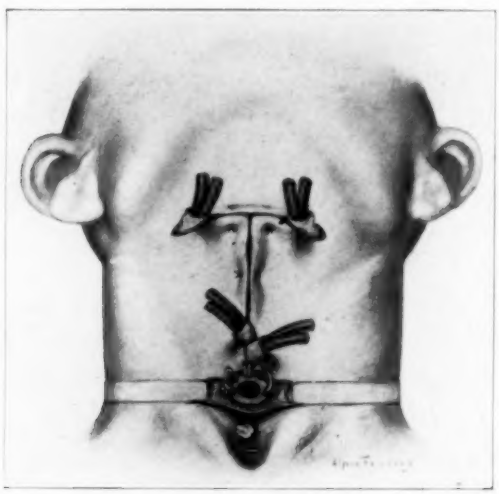

Fig. 16.—The large cannula wound with gauze in place. It must fit the trachea closely, and should not be disturbed for about four days.

the clothing. This simple device has done much to protect the trachea and lungs during the cold months (fig. 21).

COMPLICATIONS

In my series, two patients had a marked reduction in the pulse and respiration rate for a few hours after the operation. Their general condition, however, was good. The picture was that seen after an overdose of morphine and did not resemble ordinary shock.

Hiccough occurred in four cases and was quite troublesome. In one patient, aged 80, it looked serious for a time. It was finally controlled by small hypodermic doses of apomorphine. In another patient, the condition lasted off and on for two weeks and in the end had to be controlled by morphine. Tongue traction would stop it for several hours.

Hemorrhage may be immediate or late. The former is due to carelessness in securing all bleeding points at the time of operation; the latter is a manifestation of septic infection and appears either during the sloughing period, or later during the granulating period. In one patient, during the granulating period, three weeks after the operation, the hemorrhage was alarming. It occurred at intervals of from four to six hours for days and generally from a different area of the granulating surface. The bleeding area was small, but the flow was profuse. Neither large nor fractional transfusions were of any avail. It was finally stopped by curetting away all the granulations in the wound. The blood platelet count was 120,000. Later, the blood picture became normal and the coagulation time was never abnormal.

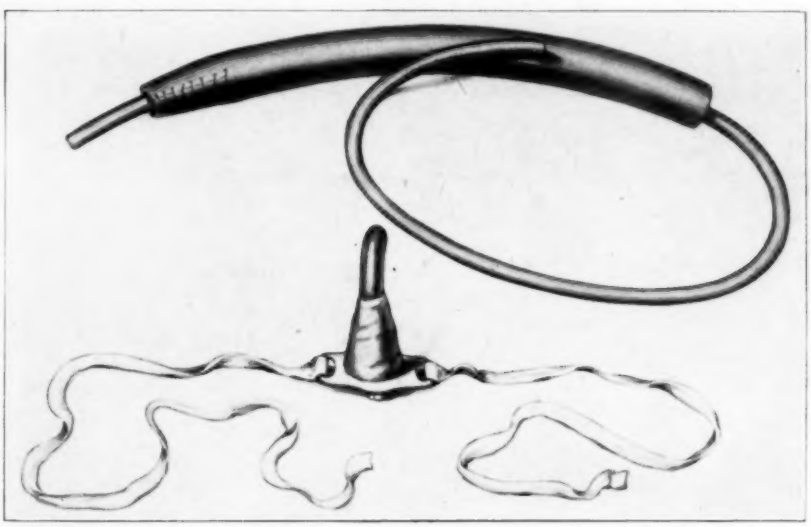

Fig. 17.—Tracheal extension tube slightly tapered at the end to insure a tight fit. Anesthesia tube. Cannula with conical dressing of bismuth vaseline gauze. The object of this form of dressing is to cork the trachea.

I have observed no pneumogastric nerve block in my patients. This may be caused by injecting procaine into the carotid sheath and by the extension of infection into the same region. An ordinary knowledge of anatomy and the usual technical skill should make the former accident impossible. If one side is spared, function is not disturbed. Both nerves must be traumatized in order to produce alarming consequences. The fascial planes of the neck are so resistant to septic invasion that infection of the carotid compartment should not occur unless its enveloping fascia is opened during the operation. There is little excuse for traumatizing this area.

General sepsis should be rare, except as a secondary result of a neglected local infection. If drainage is not complete or not well taken care of, if pus is allowed to become locked in the wound, a general septic invasion may occur. A defective metabolism—that is, diabetes—opens the way to this complication and may determine a general infection from a slight local cause.

Mediastinitis is due to the downward extension of infection along the muscular planes of the neck. Except pneumonia, this is the most imminent danger to be faced in laryngectomy. The multiple stage operation was, to a large degree, devised in order to circumvent mediastinitis and pneumonia. All that I have said on drainage and its management must be recalled and kept in mind. When the mediastinum is invaded, the patient rarely lives long enough for an abscess to form. The infection is diffuse and overwhelming and has little tendency to

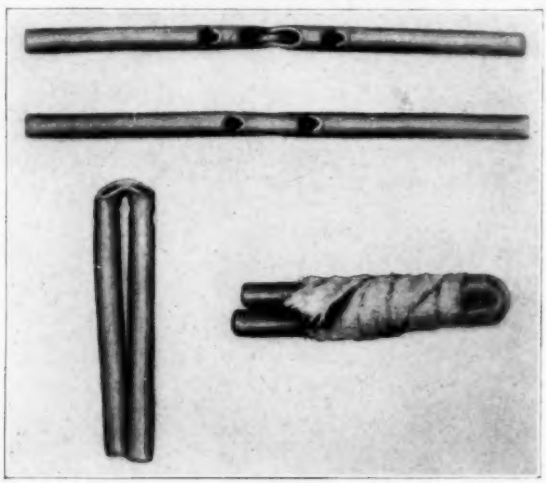

Fig. 18.—Method of making and dressing drains. The purpose of this method is explained in the text and in figure 19.

localize. Fortunately, this complication has not come under my observation in laryngectomy. In a case of Ludwig's angina, I was successful in draining a mediastinal abscess through the base of the neck.

Shock has not occurred in my patients. It is rare that the patient leaves the table with a pulse over 90. Under careful preparation and selection, the avoidance of prolonged and deep anesthesia, and of care in preventing loss of blood, shock should rarely occur. Its treatment is well known and needs no comment.

Tracheitis may be present before the operation, especially in obstructed conditions, and in patients with an ulcerating and infected neoplasm without obstruction. It may also exist independent of conditions in the larynx. Aggravated by the operation, it appears clinically

in two forms: the "dry" and the "moist." In the former, excessive secretion may threaten the lungs by gravitation and by its presence may hamper nature's efforts to check the advance of the inflammation toward the smaller bronchi. Suction through a small catheter here serves a useful end. As the catheter is inserted and withdrawn, it is rotated between the thumb and finger in order to bring its eye in contact with the tracheal and bronchial walls. Suction strong enough to make the mouth

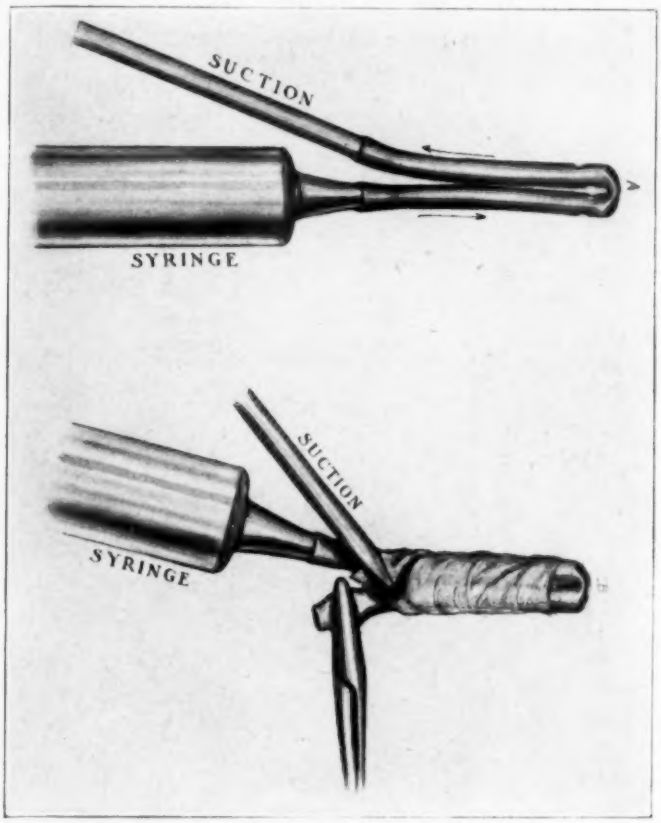

Fig. 19.—Method of cleansing the drains, making it possible to keep them in situ until pockets have formed and until postoperative edema has subsided. (*A*) Cleansing of double tube; (*B*) cleansing of gauze around tube. Salt solution is used in the syringe.

of the catheter adhere to the mucous membrane should be avoided. To overcome this, I use a special catheter resembling a small rectal tube, with openings on the side and at the end. In the dry form of tracheitis, casts may form even to the point of endangering life by suffocation. The bifurcation is a favorite place, and the casts may extend into both bronchi, resembling, when removed, a pair of breeches. I have seen

them form so rapidly that a daily removal with a bronchoscope was necessary to keep the breathway open. The trachea is cocainized and treated with a weak solution of silver nitrate and soothing oils. These casts sometimes break away and completely occlude the cannula. A competent nurse should be present constantly, and should be instructed

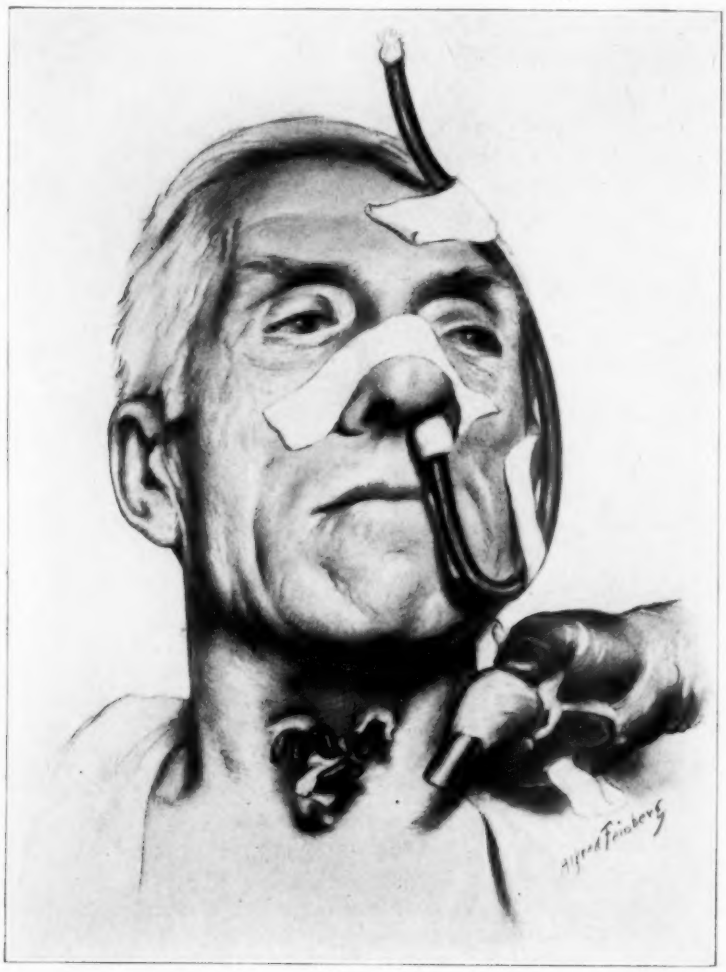

Fig. 20.—Drawing taken from photograph of a patient eight days after operation.

to remove at once everything from the mouth of the trachea at the first symptom of asphyxia. It is more than probable that deaths have occurred in the past through this complication being overlooked.

Pneumonia, generally bronchial but occasionally lobar in type, is an ever present specter, and has thwarted the surgeon's best efforts more

than any other complication. Under the present preoperative, operative and postoperative management, this danger has been reduced to the vanishing point. In my 130 laryngeal operations, bronchopneumonia occurred once in a diabetic patient, and proved fatal. Its prevention is based on all that has been set down in the foregoing and its treatment, generally futile, is that of pneumonia in general. Suction, as herein described, is a valuable adjunct in unloading the trachea and bronchi.

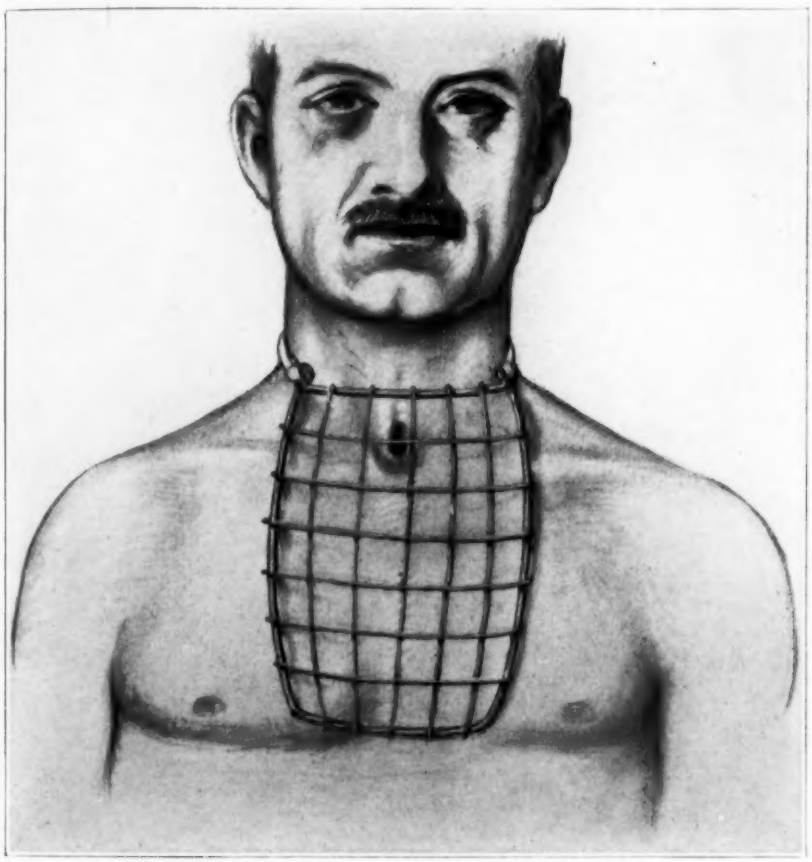

Fig. 21.—Cage worn over the chest for protection of the lungs in cold climates. A soft tight collar excludes the outer air. The patient breathes the moist warm air from about the body.

Excessive sloughing and destruction of tissue in rare cases may assume alarming proportions. In one of mine, a diabetic subject, the front of the neck melted away with incredible rapidity, bringing to mind the picture, well known years ago, of hospital gangrene. Two factors, a low somatic resistance and a high bacterial virulence, unite in this lethal process. From the mouth comes a septic invasion in prac-

tically all cases, the result of which depends almost entirely on the tissue resistance. Preoperative preparation, adequate drainage, avoidance of everything tending to lower general and local resistance are our only weapons in this emergency. The wound must be widely opened, drained and cleansed by every nonirritating means in our power. The trachea must be guarded against pus entering it. Extension along the

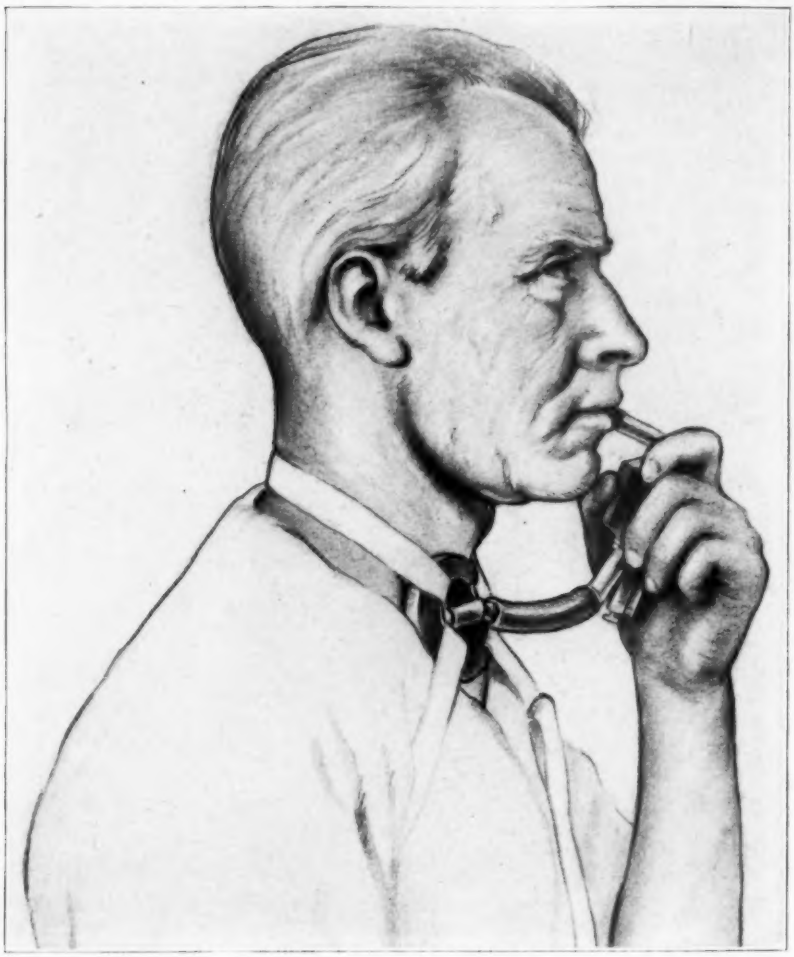

Fig. 22.—Artificial larynx in use.

fascial planes must be followed up and kept wide open. Sloughs should be allowed to separate without forcing the issue by cutting them away. When the septic storm has passed, the wound is wide open into the hypopharynx and the trachea may have sloughed away from the sternal notch. Our first concern is to restore the flaps to their original position

at the angles of the T, to the end that a bridge may be maintained across the large defect in the hypopharynx. This is accomplished with a silver wire mattress stitch on each side. Further than this, it is inadvisable to go at this time. Not until the wound is entirely free from infection and covered with healthy granulations should a complete plastic repair be undertaken. During this waiting period, which may take weeks, the feeding tube is transferred from the nose to the neck or may be removed altogether, in which case a catheter is inserted into the esophagus at each feeding. During this entire period, the opening into the trachea must be safeguarded by corking against secretion from the wound and saliva. The saliva may be taken care of by passing a tube under the bridge at the angles of the T. At the point at which the tube centers over the opening into the hypopharynx, holes are cut in it. Beyond the dressing project the tube ends, to which suction is frequently applied.

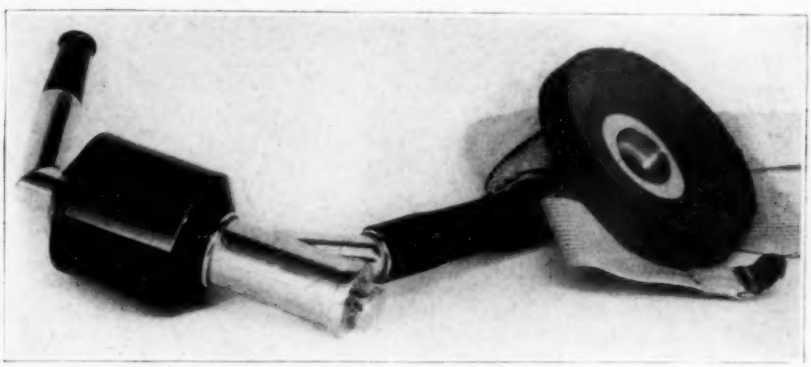

Fig. 23.—Artificial larynx. To the mouthpiece a 2-inch section of soft rubber tubing is connected, and during articulation lies on the dorsum of the tongue. This improves the quality of the voice materially. This model is for patients who can dispense with the cannula. When a cannula is worn, another connection must be made.

The plastic repair is done under local anesthesia. A thick flap on each side is formed by undermining widely on both sides. This splits the tissues into two layers, one forming the outer and the other, the inner flap. Both flaps must be as thick as possible and the undermining should be wide enough to relieve all tension on them when brought together. To relieve the tension better, silver wire stay sutures are passed through the tissues, starting and ending well out beyond the flap area. These are secured on lead disks. The inner flap is inverted into the hypopharynx with No. 1 or No. 0 catgut, and the outer flap is everted with mattress sutures so that wide raw surfaces are brought into contact. The feeding tube is again replaced through the nose into the esophagus and retained until the wound has closed. This method of dealing with

this condition has never failed in my hands. Minor fistulous openings are similarly treated in a smaller way. For many years, none of the severer types of tissue destruction has been encountered, and only occasionally has it been necessary to close a small fistula.

THE ARTIFICIAL LARYNX

Several more or less futile attempts have been made in the past to produce an artificial larynx which would be practical and reproduce the pitch and to some degree the qualities of the human voice. I had worked out in theory a plan for an artificial larynx, but could get no expert help to undertake the expense of its experimental development. The

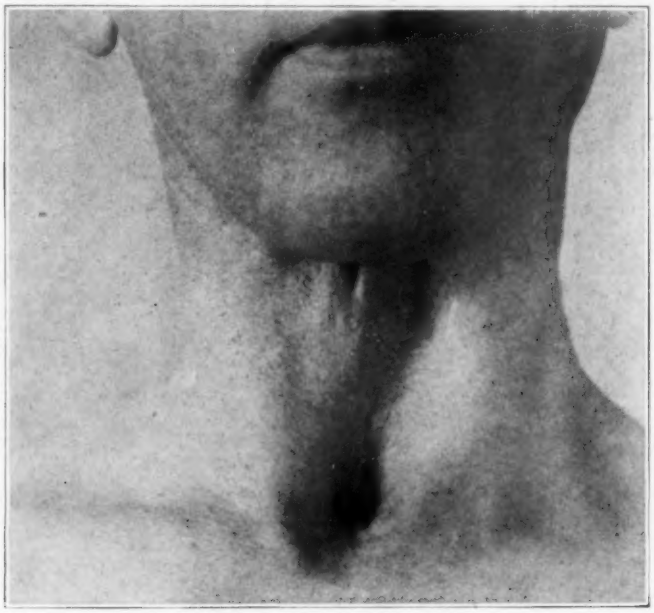

Fig. 24.—A perfect tracheal opening. Good skin and mucous membrane union and a tracheal ring just under the skin. No cannula needed.

answer was always that it would not be commercially profitable. Learning that the Western Electric Corporation was doing altruistic experimental work along lines paralleling our specialty, I laid the matter before them. They gladly took up the work with no thought of profit or loss, and together, after more than a year's experimentation on patients and models, we have produced the larynx here presented. I feel that the gratitude of our specialty is due the Western Electric Corporation for the considerable amount of money and time spent on this work, especially since our gratitude and that of the cancer victim is all that they may ever receive in return. We do not put forward

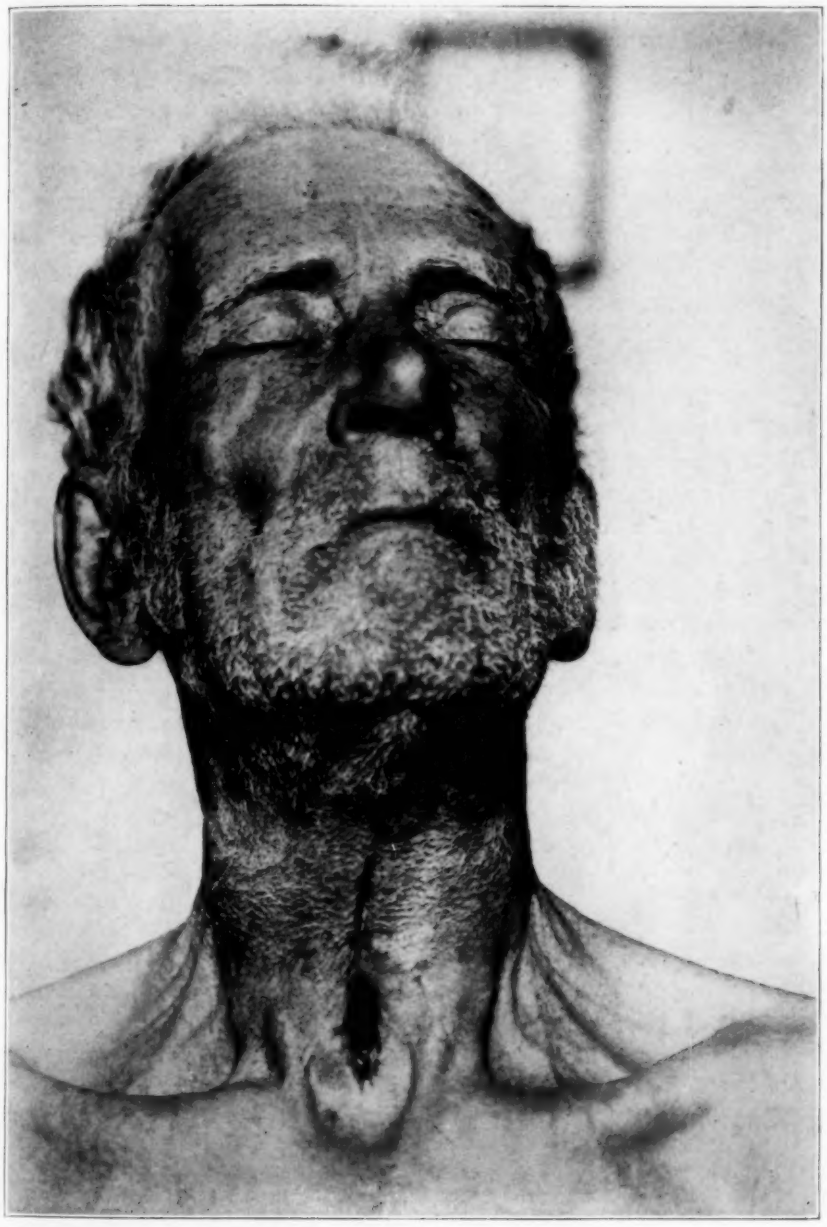

Fig. 25.—The oldest patient operated on, aged 80. He died at 84 of pneumonia. Large tracheal opening, no cannula needed.

the present apparatus as a perfect instrument. Through suggestions from surgeons and patients, we hope to improve on it. Such assistance will be more than welcome (figs. 22, 23, 24 and 25).

Technical Description of the Artificial Larynx.—The body or sound box of the instrument is made of hard rubber, separable at one end to allow for replacing the rubber vibrating element. In the half carrying this member is a metal tube extending from it with a hard rubber tip which is placed in the corner of the mouth when the larynx is in use. This tip may be extended with a piece of soft rubber tubing if so desired. The lower half of the hard rubber case contains the device for increasing or decreasing the tension on the rubber membrane, thereby changing the pitch. This is operated by a thumb screw located in one side of the inverted Y shaped tube extending from the bottom of the case. On the shaft of the adjusting screw is the sliding member of the automatic valve. A rubber tube on the remaining arm of the Y tube connects with a nipple on the trachea connection.

The trachea connection consists of a circular soft sponge rubber pad with a hole in the center. Into this hole is fitted a flanged metal disk with a hole in the center, which terminates in a nipple set at approximately a 15 degree angle to the outside face of the plate. A swivel plate carrying two straps, one to go around the neck and the other to go under the arms, takes care of the necessary adjustments and holds the trachea connection on the neck of the wearer.

To replace the rubber membrane, it is necessary only to separate the hard rubber case of the instrument and, after removing the old membrane, press the cardboard ends of the new membrane on the two locating pins. Six extra membranes are furnished with each larynx.

OPERATION

Regarding the operation photographs, the diagram shows the position of the instrument on the user and the means for holding it in position with one strap around the neck and the other under the arms. The piece of rubber tube connecting the trachea connection and the larynx is left long, so that the person using the instrument may cut it to a length best suited to his own needs.

Means have been provided for rotating the connection at the throat, changing the position of the hole in the side of the larynx and the position of the tube which is held in the mouth. These adjustable features make it possible for the larynx to be used either with the right or left hand. When talking, the automatic valve allows the user to inhale between phrases and sentences without lifting the finger or thumb from the opening in the side of the larynx. In a continuous speech, practically all the exhaling would take place around the rubber mem-

brane, causing it to produce a tone, and the inhaling would take place through the automatic valve. Therefore, it is only necessary to use the opening in the side of the instrument when the user desires to exhale without speaking and does not desire to disconnect the larynx from the trachea.

A knurled screw is provided for adjusting the tension of the rubber membrane. This screw may be adjusted while talking until a satisfactory tone is produced. A considerable number of these instruments are now in use, and many of my patients have succeeded in producing almost perfect articulation. Practice and patience are required by some at first. Others seem to grasp the technic at once.

The following has been contributed by Dr. Andrew A. Eggston, pathologist to the Manhattan Eye, Ear and Throat Hospital, New York. Dr. Eggston has studied a large number of my patients in the laboratory and his findings have given valuable directions.

According to Jurasz, malignancy of the larynx occurs in 5 per cent of all malignant tumors, of which by far the greater percentage are of carcinomatous nature. From my experience, about 2 per cent of the malignant conditions of the larynx are of sarcomatous nature. The type of sarcoma is usually lymphosarcoma, or small round cell sarcoma. This is rather slow in its growth and usually arises in the submucous tissues of the vestibule of Morgagni. The sarcomas usually have a sessile base and push either the true or false cord into the larynx, forming rather a flat, nodular tumor usually of firm consistency. The mucous membrane becomes pale over the nodular tumor. Occasionally, the small round celled tumors occur on the vocal cord and may be confused with fibroma, polypi, or even with papillomas. Microscopically, this form of sarcoma usually consists of small, round cells of lymphoid nature, and in some instances plasma cells predominate. These tumors probably belong to the group of mixed tumors, or even teratomas. They are of very slow growth, differing in this manner from small, round cell sarcomas in other regions of the body because of their slow growth and little tendency to metastasis. Round cell sarcomas of the larynx are of semibenign nature; however, they will recur unless radically removed. Spindle and giant cell sarcoma are rare in the larynx. True lymphosarcoma and spindle cell sarcoma may involve either the epiglottis or pharyngeal wall. Lymphosarcoma from the tonsils are likely to infiltrate the larynx secondarily, in which instance diagnosis is readily made by localizing the primary tumor in the pharynx.

Carcinoma forms about 98 per cent of the malignant tumors of the larynx. Histologic study of carcinoma of the larynx permits of the following classification with the percentage of the frequency of the occurrence of each type:

1. About 96 per cent arise from the stratified surface mucous membrane of the larynx, and consist chiefly of the squamous cells which form typical squamous-cell epitheliomas, or acanthomas.

2. About 2 per cent of epitheliomas of the larynx are basal celled tumors.

3. About 1 per cent of carcinomas of the larynx are papillary carcinomas.

4. About 1 per cent arise from the mucous glands in the larynx and are known as adenocarcinomas.

Carcinomas of the larynx have been designated by Kirshaber as intrinsic when situated on the true or false cords of an anterocommissura, and extrinsic when situated near the arytenoid cartilages, lateral plicae and sinuses, the arytenoid ligaments, or at the base of the epiglottis. This classification is only of

importance because of the relatively more rapid growth and spread of the so-called extrinsic carcinoma. The intrinsic carcinomas, clinically, manifest rather slow growth for a period of time. This early latency is practically the only difference between intrinsic and extrinsic carcinomas, because ultimately the intrinsic carcinomas will assume the same characteristics as the extrinsic. The gross pathology of the carcinomas of the larynx may be divided into their earlier and later characteristics. In the earlier stage, carcinomas of larynx are usually sessile, rarely presenting a pedicle, grayish white, nodular, excrescences of the mucous membrane of the larynx. These are easily recognized when situated on the vocal cords, in which there will be functional disturbance. The surface of the nodule may be papillomatous or smooth. The consistency is usually firm or hard, and almost cornified in nature. At this stage, the growth may be confused with polypi, fibroma, or simple papillomas. (Frozen sections at this period of the intrinsic carcinoma may be advised because the nature of the circulation and consequential lack of spread of the tumor renders this diagnostic procedure harmless.)

The early carcinoma may be situated on the cords, or on the antero-commissura, the most common location being on the true cords, not infrequently in the vestibule and false cords, the arytenoid region, or at the base of the epiglottis. The accurate diagnosis at this stage of malignancy is of greatest importance because of the value of early and radical surgery. In the early stages of carcinoma it is not infrequent to find implantation of the tumor from one cord to another, particularly when they are in contact. Not infrequently, the tumor will develop on one cord, and then soon develop on the other cord, acting in this matter somewhat like papilloma. It has been our experience that the tumor is likely to begin in the middle of the true cord, extend forward toward the anterior commissura, producing thickening of the epithelium and induration of the cord which, on microscopic section, shows subsurface extension along the lymphatics of the cord anteriorly through the commissura. It is our experience that intrinsic carcinoma usually extends anteriorly along the lymphatics instead of posteriorly, because in a number of instances sections taken anterior to the tumor have revealed submucous extensions of the tumor, while sections taken posteriorily have failed to show such extensions.

The gross appearance of well developed carcinoma of the larynx makes the diagnosis easy. In the squamous cell type there is usually a broad sessile, somewhat nodulated, firm, grayish, tumor which encroaches on the lumen of the larynx and interferes with the vocal cords. If very large, both true and false cords may be entirely covered with the mass; the tumor extends into the vestibule, penetrates the submucosa, produces a perichondritis, and in some instances erodes the cartilage, extends downward into the larynx and trachea, upward into the pharynx and backward into the esophagus and early involves the cervical lymphatic glands. In some instances, the tumor in the larynx may grow to the size of an English walnut, without ulceration. In other instances, ulceration is an early degenerate change in the tumor, in which instance there is perhaps an ulcer that shows no tendency to heal, spreading gradually, covered with necrotic material which may be coughed up and from which diagnosis may be made. The ulcerative types infiltrate rapidly and show early metastasis, and are of more malignant type.

A brief discussion of the microscopic characteristics of the various types of carcinomas of the larynx follows:

1. Histologically, the most common squamous cell type of epithelioma is composed of hyperplastic and hypertrophic squamous epithelial cells forming epithelial excrescences, and penetrating papillae which have a great tendency to infiltrate the submucosa and surrounding tissues, forming interlacing bands and threads of epithelium. The marginal epithelium of the papillae shows irregular large cells with atypical mitotic nuclei. In some instances giant cells are formed, containing numerous nuclei. In some areas there are detached individual cells scattered through the stroma. In the central portion of the

tumor masses, the cells show keratinization of the epithelium with epitheliomatous pearl formation. In the central zones of other areas of epithelial cells, the cells are necrotic, or show cyst formation. The cysts are usually filled with cellular débris and leukocytes. The stroma around the epitheliomatous cells are profusely infiltrated mononuclear plasma cells and often are eosinophils. Extending beyond the gross tumor mass, not infrequently extensions of strands of cells which have involved the lymphatics may be noted. On the whole, the cartilages show resistance against the invasion of the tumor cells, but occasionally beautiful instances of infiltration of the cartilage of the larynx may be noted. In the intrinsic tumor there is greater tendency to epithelial pearl formation and keratinization of the epithelium than in the extrinsic tumor.

2. Basal cell carcinoma in the larynx is composed chiefly of cuboid, or elliptical cells, and arise from the basal layer of cells of the mucosa epithelium. This variety of tumor in the larynx is unusual. It is noted chiefly by softness and early ulceration. Histologically, the cuboid cells form papillary structures which have the tendency to infiltrate, but do not hyalinize and form epithelial pearls. This form of carcinoma of the larynx retains the characteristics of basal cell sarcoma in other parts of the body, in that the ulceration spreads rather rapidly and does not metastasize with the frequency and rapidity of the squamous cell type. If radium has any virtue in laryngeal carcinoma, it is on this variety of tumor that it should be used. Experience has shown that radium has beneficial effect on true basal cell type of tumors, and has little beneficial effect and even encourages the progress of the squamous cell types. The basal epithelioma in the larynx may be secondary to basal epithelioma in the pharynx, or tonsillar fossae, in which this form of tumor is not uncommon. Basal cell epithelioma may be secondary to papillomas when the deeper cells of the papillomas assume a malignant nature and infiltrate the surrounding tissues.

3. The papillary carcinoma of the larynx is usually secondary to papilloma of the larynx. Usually the papillomas have existed for some time in the larynx, or have recurred after several removals. The diagnosis of this form of carcinoma at times is very difficult, because the sections of the mass do not reveal the true nature and infiltrate growth characteristic of the cells. It is usually the cells situated at the base of the papillae which infiltrate, and unless the section removed includes a great deal of the subepithelial tissue, the relationship of the epithelium and the stroma cannot be studied. Even though this relationship can be studied, it is impossible to know the biologic tendencies of the cells, and to state the exact degree of malignancy. Not infrequently, some form of epithelioma develops on the base of papillomas. Histologically, this type of tumor is rather difficult to diagnose, and the clinical nature of the tumor should be the deciding factor as to the degree of malignancy in any individual case. Because of these occult characteristics, these tumors have been called larval carcinomas.

4. Adenocarcinoma of the larynx is uncommon. However, such a tumor may arise from the mucous glands or ducts of the vestibule, or may be a part of a mixed tumor (teratoma) which is not infrequently located in the pharynx and larynx. This form of carcinoma may be scirrhus, or medullary, in nature while in some instances it may contain rather well-formed glands with mucoid secretion and marked epithelial hyperplasia with infiltration. Adenocarcinomas are the least malignant forms of carcinoma of the larynx.

CLINICAL AND EXPERIMENTAL STUDY WITH SOME PHYSICAL AGENTS IN PARTIAL DEAFNESS

PRELIMINARY REPORT

A. R. HOLLENDER, M.D.

AND

M. H. COTTLE, M.D.

CHICAGO

While the defective hearing problem has been the objective of investigators for many years past, it has assumed an added impetus since more improved types of electrical apparatus have been available. It is true that this newer equipment has lent reinforcements to the pretenders —charlatans and quacks—yet this fact should not overshadow the possibilities for good which might be accomplished by some of the recent advances in electrotherapy. For it is only by adequate and efficient scientific investigations that we are in a position to pass on the relative merits of a method.

The experiences of some otologists with diathermy and other electrophysical agents in partial deafness have prompted us to conduct systematic researches in this problem, with the chief purposes in view of determining not only the clinical value of these agents but also their scientific basis.

The roentgen ray has been employed experimentally in defective hearing, but there still exists some doubt as to its true value. This paper excludes a consideration of roentgenotherapy in partial deafness, because of our limited experience with it. Investigations were made on the use of diathermy, the sinusoidal current, galvanism, and ultraviolet irradiations, either singly or in combinations, in all types of acquired deafness.

LABORATORY STUDIES

Some of our original experimental work with diathermy was performed on cadavers. As it was recognized that the results obtained had little, if any, clinical application, further studies were made on living dogs, properly anesthetized. This was done primarily to establish a basic and fundamental guide.

Experiment 1.—Electrodes were placed in the external auditory meatus of the dog, after most of the pinnae had been removed. By means of a thermometer, placed beneath the skin under the electrodes, another under the muscle and one under the skull in as close proximity to the electrode as possible, the temperatures were determined, after

passing a diathermy current of 400 to 500 milliamperes for five to ten minutes. The results were as follows: An increase in temperature under the skin, but only a very slight elevation under the bone and under the muscle.

Experiment 2.—A mesh electrode was placed on the shaven skin just behind the ear, and a larger (indifferent) electrode on the shaven jaw of the opposite side. A thermometer was introduced into the middle ear, through the drum membrane. With 400 milliamperes d'Arsonval current, an elevation in temperature of 2 to 3 degrees was noted within five minutes.

TABLE 1.—*Ear Experiment No. 3, Aug. 25, 1925*

	D'Arsonval Current					
	500 Milliamperes			750 Milliamperes		Animal still alive
Time	Start	5 Min.	10 Min.	5 Min.	Stop	20 Min. Later
Under skin	95.0	98.7	100.6	101.8		94.6
Under muscle	98.7	104.6	104.2	106.0		99.0
Under bone	98.3	100.0	100.6	101.2		99.0
In brain	100.0	100.0	100.0	100.2		100.0
Rectal	100.0	100.8	100.8	100.0		100.8

TABLE 2.—*Ear Experiment No. 4, Sept. 25, 1925*

	D'Arsonval Current						Later	
	500 Milliamperes			750 Milliamperes		Stop		
Time	Start	5 Min.	10 Min.	5 Min.	10 Min.		5 Min.	15 Min.
								Animal killed
Under skin	92.0	95.0	96.0	102.0	100.0		92.0	90.0
Under muscle	97.5	100.8	102.0	106.2	107.0		105.0	103.0
Under bone	97.5	98.5	99.0	100.0	101.5		101.5	102.8
In brain	98.8	99.2	99.3	100.4	101.0		101.5	101.3
Rectal	98.8	98.8	98.8	98.8	98.8		98.8	97.0
Electrode	95.0	97.0	99.5	99.5	99.5		96.0	98.2

TABLE 3.—*Ear Experiment No. 5 (Animal Dead)*

	D'Arsonval Current				
	15 Min.	500 Milliamperes	750 Milliamperes		5 Min.
Time	Later	5 Min.	10 Min.	Stop	Later
Under skin	90.0	103.5	109.8		100.0
Under muscle	103.0	110.0	113.0		112.5
Under bone	101.8	103.5	105.5		106.2
In brain	101.3	103.0	104.5		104.8
Rectal	97.0	97.0	97.0		.....
Electrode	98.2	114.8	117.0		.....

Experiments 3 and 4.—With the electrodes as in experiment 2, a thermometer was placed under the skin, another between the muscles and skull, and still another beneath the skull on the dura. A fourth thermometer was inserted into the brain substance and a fifth into the rectum. The tables give the results of these experiments, and may be

summarized thus: A rise in temperature of nearly 6 degrees between the muscle and bone; underneath the bone an increase of two and one-half degrees; very slight increase in the brain; the body temperature was unchanged during the experiment.

Experiment 5.—This was similar to experiments 3 and 4, repeated on a dead animal.

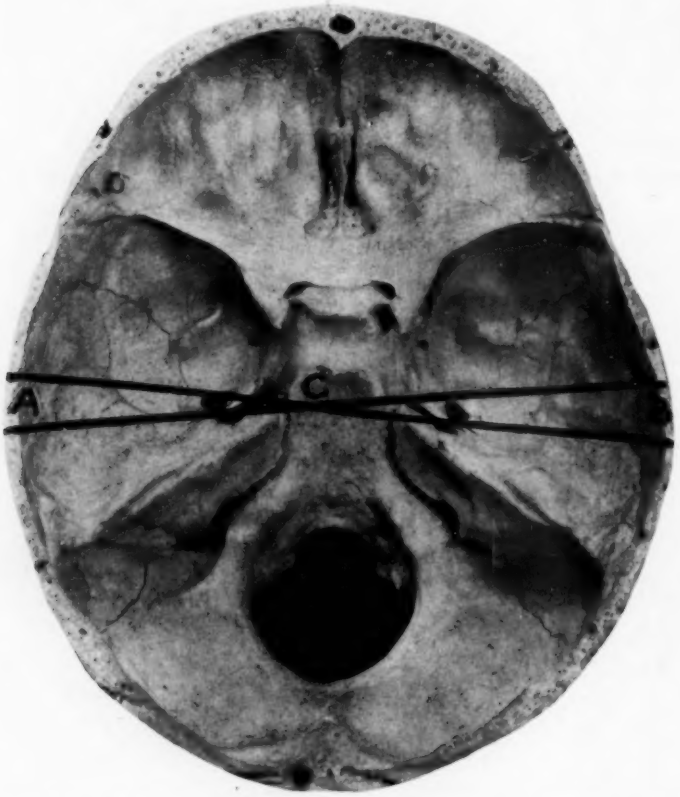

Fig. 1.—*A* and *B* represent electrodes within the external and auditory canals. Theoretically, the location of maximum heat generation by diathermy would be on both sides of *C*, and does not include the tympanic cavity.

ESTIMATION OF MAXIMUM DIATHERMY EFFECT

Theoretically, the area mostly influenced by a diathermy application may be estimated on a model or skeleton of the parts with two wires. The wires are crossed so that the spaces between the ends will represent the size and position of the electrodes used. Where the wires cross will represent the region of maximum effect.

Thus, as in figure 1, it is seen that with the wires in position, representing the external auditory canals, the maximum heat area is posterior

and medial to the middle and inner ear regions. Figure 2 shows wires in position for the maximum effect on this area.

DEDUCTIONS

From the standpoint of clinical application, these experiments are significant because they lead to several definite deductions:

1. Diathermy introduced by way of the ear canals does not reach the middle and inner ears with adequate intensity.

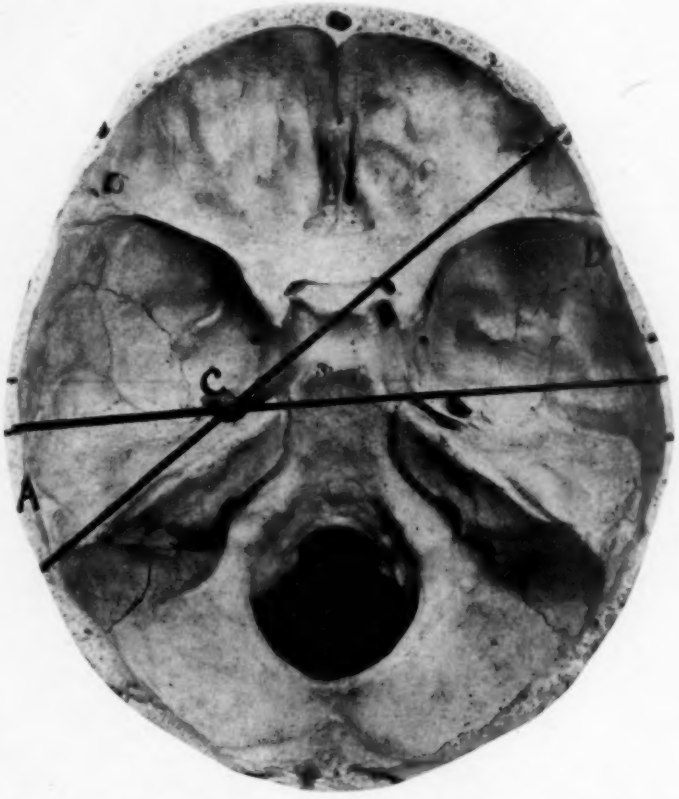

Fig. 2.—*A* extends from posterior wall of external auditory canal to posterior limit of mastoid; *B* extends from anterior wall of external auditory canal to the external canthus of eye. *A* is the position and relative size of the active electrode, *B*, the indifferent. Region between *A* and *C* is, theoretically, the location of maximum heat generation by diathermy and includes the tympanic cavity and labyrinth.

2. Diathermy introduced by an active electrode behind the external ear, with the indifferent electrode anterior to the ear on the opposite side, produces a substantial rise in temperature in the region of the ear from the middle ear to the inner surface of the skull.

3. With diathermy, the maximum temperature is reached only after ten minutes application.

4. With d'Arsonval currents of 300 to 500 milliamperes, there is practically no effect on the brain nor on the body temperature.

5. The highest temperature obtained was between the muscle and bone, where the increase was usually greatest.

6. In living tissue there is a return to normal temperature within twenty minutes; in dead tissue the change is much more gradual (up to two hours).

7. Under identical conditions, a d'Arsonval current produces higher temperatures in dead than in living tissues.

CLINICAL STUDIES

In undertaking our clinical experimental work with different physical agents, the cases selected for treatment were chiefly those of chronic

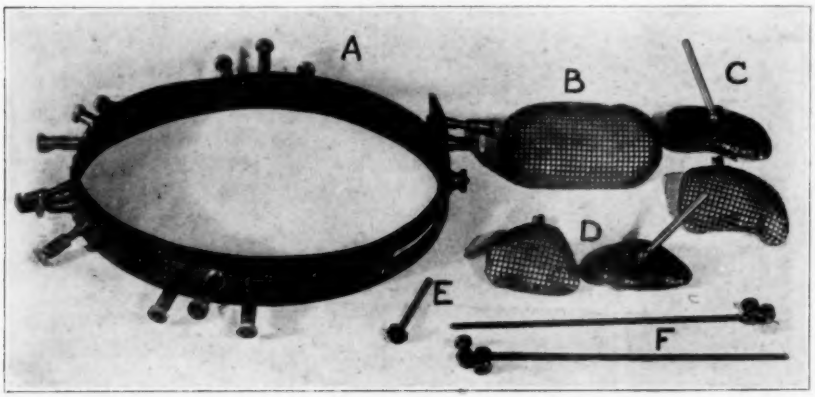

Fig. 3.—New headband and electrodes (author's design) for administering diathermy to any part of the head. *A*, headband with binding posts; *B*, indifferent electrode; *C* and *D*, smaller or active electrodes for ear and sinus treatments; *E*, small tubular electrode for warming drum membrane; *F*, electrode holders.

catarrhal otitis media, usually with complete or partial fixations of the stapes; and some cases were clinically much like otosclerosis and partial nerve deafness. Many of the patients were previously treated by various methods and some had had operative work done on the nose and pharynx. Psychologic reactions were recognized, when possible, and their effects discounted. After six months of observation, the following were our conclusions: (1) Negative galvanism was of slight benefit in a few cases; (2) the sinusoidal current in itself had little or no value; (3) diathermy applied by the methods advocated heretofore, that is, via the external auditory canals, is of doubtful benefit; (4) local ultra-

violet irradiations to the ears have no therapeutic effect so far as hearing is concerned; (5) body irradiations with ultraviolet light may influence systemic dyscrasias, and thus act indirectly as an influencing factor.

NEW DIATHERMY TECHNIC

The technic which we now employ is based on the results of our laboratory studies. The electrodes of the apparatus which we devised

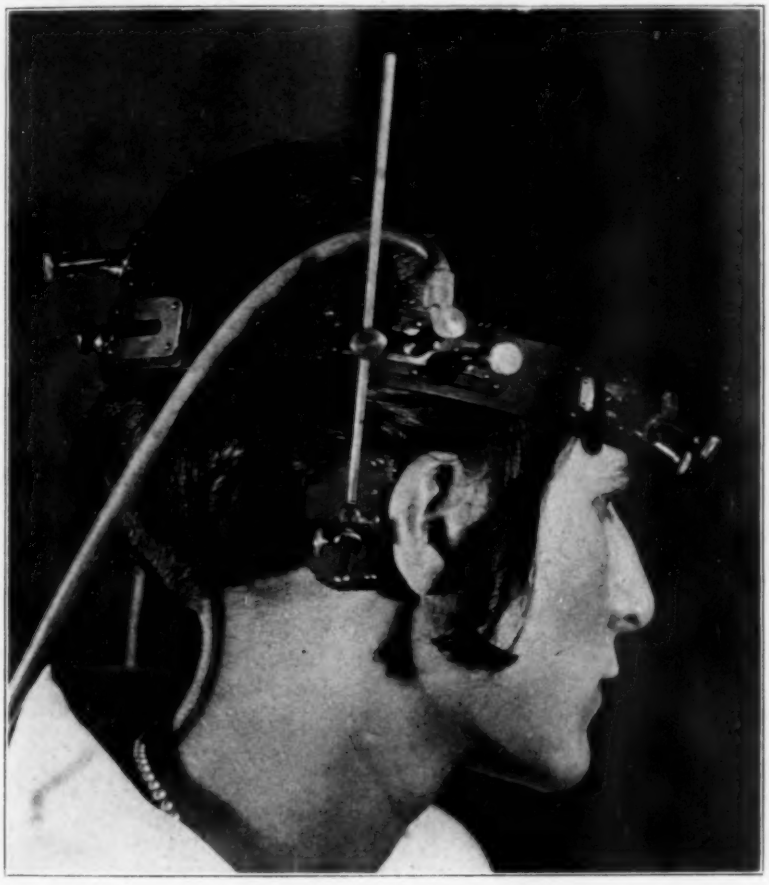

Fig. 4.—Smaller or active electrode over right mastoid region for treatment of right middle ear.

are so applied that the heat is not directed through the ear canals (fig. 3). Instead, the active electrode is placed in contact with the mastoid area of the ear to be treated (fig. 4), while the indifferent electrode is placed on the opposite side, anterior to the ear. Thus, only one ear is treated at a time (fig. 5). By means of this technic, theoretically, and prac-

tically also, the point of greatest heat is at the desired area, namely, the petrous portion of the temporal bone. From three to four treatments weekly are given, with a milliamperage of 300 to 400. The time of each diathermy treatment is thirty minutes, after which negative galvanism is applied for five minutes. The actual number of treatments necessarily varies, and can be determined only by the requirements of each individual case.

Fig. 5.—Position of indifferent electrode for right middle ear treatment.

If improvement occurs, it is usually apparent to the physician during the third week of treatment. The hearing should be tested by the various methods at least once a week. One fact is definitely established if improvement is sought, and that is persistency in the treatment.

We present case reports (table 4) with great reluctance because progress has been noted in subjective terms and in whispered voice tests.

In performing the latter, we always had reasonably uniform conditions, a quiet hallway with distances marked off on the wall, loud forced whispered voice after expiration, and all tests by the same person. We realize, however, that, at best, these tests give inaccurate figures, and therefore cannot be accepted in any other way except to suggest the progress made by the treatment.

To overcome some of the difficulties of testing, we recently installed an audiometer, and hope by this means to be able to present, at a later time, precise records of qualitative and quantitative changes wrought by various forms of treatment.

PROBABLE EFFECTS OF DIATHERMY ON PATHOLOGIC ANATOMY

The three types of partial deafness, commonly recognized, are, chronic catarrhal otitis media, otosclerosis and nerve deafness.

Chronic Catarrhal Otitis Media.—In chronic catarrhal otitis media, according to Politzer,[1] the pathologic changes extend over the whole mucous membrane of the middle ear, or may be limited to circumscribed areas. "The structural changes in the mucous membrane consist of an increase in substance caused by round-cell infiltration, or in partial or total transformation of the newly formed round cells into fibrous connective tissue. The newly formed connective tissue may remain, or lead to fixation of the ossicles by its contraction, calcification or ossification."

What is the effect of diathermy on such pathology? In general, it may be said that diathermy produces a localized heat in deep tissue, the penetration and degree of which are always under control. In treating an ear in which there are structural changes in the mucous membrane to the point of fibrous connective tissue formation, or fixation of the ossicles, the purpose of applying diathermy is similar to that of treating a joint. Absorption of calcified deposits may be effected to such a degree that function may be partially restored at least. Furthermore, diathermy increases the arterial flow in the part treated, and augments the return circulation. Intercellular tension is thus altered and cellular activity stimulated. Again, it is fairly well accepted that sedative diathermy aids in the absorption of effusions, the softening of exudates and fibrous tissues, and in the relaxation of muscle spasms.

Otosclerosis.—Politzer believes that in otosclerosis there is, primarily, disease of the bony labyrinthine capsule. The pathologic changes in the labyrinth as noted by him are: osseous new formations, atrophy of Corti's organ, atrophy of the acoustic nerve in the cochlea and of the ganglionic layer in the spiral ganglion, and atrophy of the origin of the acoustic nerve.

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1. Politzer, Adam: Diseases of the Ear, Philadelphia: Lea and Febiger (Translation by Ballin and Heller).

TABLE 4.—*Result of Tests on Human Subjects*

Patient	Age	Date of First Examination	Tuning Fork Tests of Ear Treated				Whispered Voice	Naso-pharyngeal Pathology	Tinnitus	Duration of Impaired Hearing	Previous Treatment	Familial History	Whispered Voice in Ear Treated			Results
			High	Low	Rinne	Weber							After 6 Treatments	After 12 Treatments	After 24 Treatments	
R. B.	23	12/22/24	1,024	64	Pos.	0	R2′	0	0	2 yr.	No	+	R6′	R6′	R7	No improvement
T. G.	43	4/15/25	2,048	256	Neg.	R	R2′	+	+	12 yr.	Yes	+	R5′	R15′	R27′	Improved
M. S.	45	11/ 8/24	1,024	512	Neg.	L	L6′	+	0	10 yr.	Yes	++	L10′	L6′	L35′	Improved
O. P.	45	12/12/24	2,048	128	Neg.	R	RO	+	0	15 yr.	Yes	+	R10′	R20′	R30′	Improved
T. O'B.	27	4/21/25	2,048	64	Pos.	0	Cont	0	0	20 yr.	Yes	0	L.W.V. 18″	W.V. 24″	....	Slight improvement
R. R.	28	2/ 7/25	1,024	64	Pos.	0	R4′	++	0	8 yr.	Yes	0	R10′	10′	10′	Slight improvement
A. M.	23	7/ 8/24	2,048	128	Neg.	L	R2′	+	0	7 yr.	Yes	0	R6′	R15′	R20′	Improved
V. B.	30	6/25/25	2,048	256	Neg.	0	R2′	+	0	10 yr.	Yes	0	R12′	R20′	R27′	Improved
S. C.	37	4/11/25	2,048	512	Neg.	L	R2′	+	Occ.	15 yr.	Yes	No	Same	R3′	R10′	Slight improvement
N. La.	35	7/11/25	1,024	64	Pos.	0	Cont	+	0	10 yr.	Yes	+	R0′	R0′	R0′	No improvement
F. Lu.	20	6/23/25	2,048	256	Neg.	0	R3′	++	0	2 yr.	Yes	0	R10′	R12′	R18′	Improved
D. W.	27	9/13/24	2,048	512	Neg.	0	R2′	+	+	3 yr.	Yes	+	R6′	R12′	R25′	Improved
L. Z.	18	12/13/24	1,024	512	Neg.	R	R1′	++	0	15 yr.	Yes	0	R6′	R10′	R25′	Improved
E. B.	32	8/24/24	2,048	64	Pos.	0	L6′	+	0	5 yr.	Yes	0	L10′	L25′	L25′	Improved

Syphilis, gout, uric acid disease, and other conditions, variously have been associated with otosclerosis. Attention has been directed to the relationship of the blood calcium to this type of impaired hearing. The contention of Leicher,[2] that a deficiency in the calcium retention of the body is an etiologic factor, has been considered by many investigators.

Kopetzky and Almour,[3] after their study, confirmed the conclusions arrived at by other investigators, that otosclerosis is probably associated with a calcium deficiency. Some writers, however, are inclined to believe that the most important etiologic factor is the deficiency of the fat soluble vitamin A.

On the basis of the accepted local pathologic findings, and the recent investigations concerning the constitutional factors involved, it is quite obvious that more than local treatment would be necessary to influence the impaired hearing in otosclerosis.

Hence, treatment must be directed toward a correction of the constitutional error. General ultraviolet irradiations were found of great value for this purpose, since it is now accepted that this agent influences the calcium retention in the body.

Treatment directed toward correction of any vitamin deficiency also influences selected cases. While diathermy locally, and ultraviolet radiation generally, have appeared to be helpful in some selected cases, it is not intended by this report to convey the idea that these measures are heralded as curative.

Nerve Deafness.—Reference has already been made to some of the nerve changes that occur secondary to otosclerosis. All nerve disorders ranging from the simplest form of neuritis to complete degeneration of the nerve are known to occur. Such changes may be secondary to affections in the ear, nose, or other parts of the head. They may exist as complications or sequelae of a multitude of systemic diseases.

It is quite obvious, therefore, that indications for treatment are manifold and varied, and that the prognosis is in direct proportion to the extent of the pathology.

The beneficial effect of diathermy on such nerve changes is problematic. Theoretically, its sedative action synergized with negative galvanism is indicated. Clinically, with us, however, the application of these two agents has here been definitely empyrical.

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2. Leicher, Hans: Alterations of the Calcium Content of the Blood in Otosclerosis and Their Relation to Internal Secretion, Ztschr. f. Hals-, Nasen- u. Ohrenh. **3**:279 (Nov. 1) 1922; Further Report on the Decrease of Blood Calcium in Otosclerosis and the Possibility of Affecting It by Treatment, ibid. **4**:74 (Dec. 6) 1922.

3. Kopetzky, Samuel J., and Almour, Ralph: Blood Calcium in Undifferentiated Deafness. A Preliminary Report, Arch. Otolaryngol. **1**:473 (May) 1925.

COMMENT

The animal and clinical studies were performed in an attempt to establish a basis for the use of diathermy in the treatment of progressive, undifferentiated defective hearing. It is not intended to maintain that electrophysical therapy is specific, nor that it replaces other orthodox measures which are known to offer favorable prognosis, but clinical experience in a fairly large series of cases has demonstrated that it is of some value in chronic catarrhal deafness even after other accepted measures have failed.[4] Further experience may show also its ability to arrest the symptoms of otosclerosis. The improvement obtained is dependent on four important factors: (1) Nature and extent of pathology; (2) correct apparatus and electrodes; (3) proper application based on anatomic principles; (4) persistent treatment over a long period of time.

The permanency of the improvement and to what extent a curative state can be approached, will be determined only after sufficient lapse of time. For the present, however, from the results thus far obtained, we feel justified in continuing this experimental work, and have reported our findings in the hope that others will become interested in conducting a similar study.

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4. Linn, E. G.: Diathermy in Middle Ear Pathology, J. Radiol. **6**:102 (March) 1925.

GRADENIGO'S SYNDROME IN MASTOID DISEASE

REPORT OF A CASE *

HENRY DINTENFASS, M.D
Assistant Professor of Otology, Graduate School, University of Pennsylvania
PHILADELPHIA

The Gradenigo syndrome consists of a definite entity, occurring in the course of acute otitis media, and presenting certain clinical symptoms, the most predominating of which is paralysis of the abducens nerve. The condition was described in 1904 by Gradenigo, whose careful studies and observations threw valuable light on a hitherto obscure subject, and one not commonly met. Seldom will an otologist see more than three or four cases in a busy lifetime. However, when it does occur, there is nothing that will cause more anxiety and concern. Most textbooks dismiss the subject with a few lines, while a great many fail to mention it. Since Gradenigo's excellent presentation twenty years ago, there has been less than 200 cases reported on both sides of the Atlantic. In 1924, William Harden Sears wrote a splendid résumé of the subject including his own case report, covering the ground very thoroughly.

PATHOLOGY

The exact pathology of the syndrome is somewhat in dispute. In this connection, it is obvious that a knowledge of the position and relation of the sixth nerve is essential. It is to be remembered that the abducens, after it pierces the dura, enters Dorello's canal, which is a triangular shaped space at the apex of the petrous pyramid. In this canal the nerve runs near the inferior petrosal sinus; after leaving the canal it lies in close proximity to the depression holding the gasserian ganglion. Forward from here, it finds its way along the outer wall of the cavernous sinus, emerging through the sphenoidal fissure to enter the orbit. It is generally agreed that the lesion in Gradenigo's syndrome is a localized circumscribed meningitis, secondary to an involvement of the bony area lying adjacent. The nerve may become involved in the inflammatory reaction in its course, or the inflammation in the dural structures surrounding the nerve may cause pressure on it. In either instance, an abducens paralysis results. Some observers, however, believe that the condition is merely a toxic neuritis, the meninges taking no part in the condition.

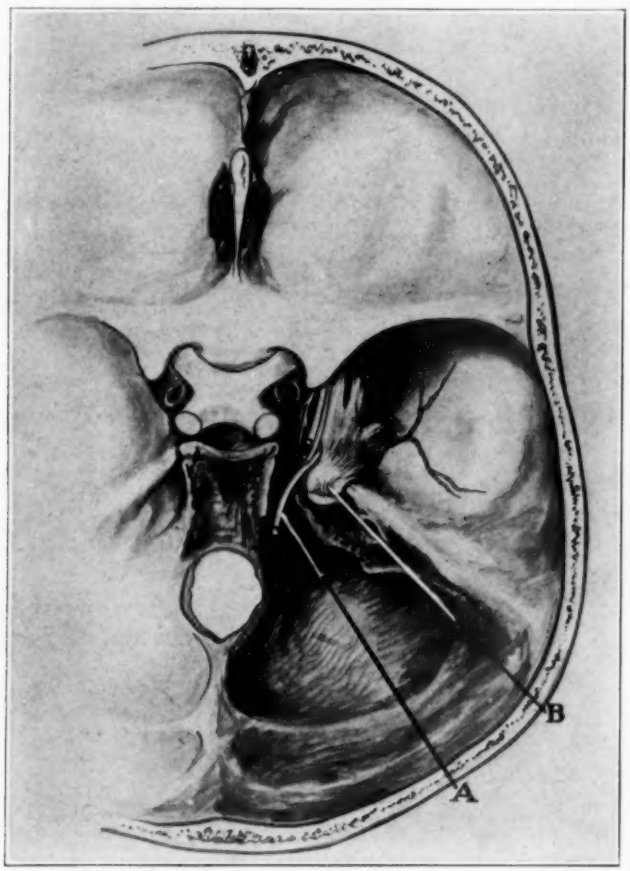
My purpose in reporting this case is to enumerate certain features in the symptomatology and operative findings, which when compared with the notes of other case reports will help to formulate more definite ideas as to the etiology and pathogenesis of this condition.

REPORT OF CASE

History.—J. R., a white girl, aged 6 years, who complained of severe pain in both ears, was seen by me on Sept. 26, 1925. The condition was a complication

* Read before the Philadelphia Laryngological Society, Jan. 5, 1926.

of influenza and bronchitis, from which the child had been suffering for ten days. She was quite thin and her color was poor. The former medical history showed that she had had double pneumonia several months previously, and that she caught cold frequently on the slightest provocation, necessitating staying in bed for days at a time. Examination of the right ear disclosed a slight serous discharge, the wiping away of which presented a pinpoint perforation and a markedly bulging tympanic membrane. The left ear canal contained no discharge, and the drumhead on that side was also bulging but not so much as on the right. The temperature was 102 F., the pulse 120, and respiration 30.



The abducens nerve (a) in close proximity to the gasserian ganglion (b) at the apex of the petrous pyramid, the site of the lesion in the Gradenigo syndrome.

A double paracentesis was performed, which was followed by a considerable amount of sanguineous discharge on both sides. The pain was relieved by the discharge, which became purulent in a few days. There was an improvement in the temperature curve and the drumheads looked more normal. There was some cough which had persisted since the beginning of her illness. This condition continued for about two weeks, at the end of which time it was noticed that the gland at the tip of the right mastoid was distinctly palpable. There was no sagging of the posterior-superior canal walls, and no tenderness was elicited over either mastoid. There was, however, increased fretfulness, and the temperature having risen, the child was sent to the polyclinic hospital for study.

On admission, October 6, the temperature was 192.3, the pulse 118, and respiration 32. The cough was still present. During the physical examination, one of the physicians suspected a pericardial effusion, so a roentgenogram of the chest was taken, which disclosed a somewhat enlarged heart shadow but no definite indication of fluid in the pericardial cavity. The roentgenogram of the mastoid processes revealed that both temporal bones were of the extreme pneumatic type of development, yet no positive evidence of mastoid disease could be demonstrated. The leukocyte count was 16,000, with a polymorphonuclear percentage of 70. Several days later, another test showed that the white blood corpuscles had come down to 10,000. Examination of the urine disclosed many pus cells, following which came the thought of pyelitis. At this time there was some discharge from both canals, but it was not so profuse as it had been the previous week. The temperature, however, still continued and despite the negative roentgenogram and clinical evidences of disease in the bone, and the possibility of the presence of pericarditis and pyelitis, it was decided to drain both mastoids.

Operation.—This was performed on October 13, under nitrous oxide gas and oxygen anesthesia. The right side was operated on first; the usual postauricular curvilinear incision was made and the periosteum stripped very easily. When the cortex was removed, two important facts were noted; first, the absence of any great pathologic changes, and, second, the extensive pneumatic character of bone found. The cells were so large and the intracellular walls so thin that it was a simple matter with a few strokes of the gloved finger to convert the entire mastoid process into one cavity. Pus was discovered only after the aditus had been exposed, and a probe had been passed into the tympanum. Operation on the left side disclosed the same general conditions as on the right, with even less evidence of disease. Bacteriologic examination of pus found showed staphylococci and streptococci.

The patient was returned to her bed in good condition. The next day, October 14, the temperature rose to 104.5 F., but apparently this was not of serious import because it came down almost to normal on October 15, as also did the pulse and respiration. On the morning of October 16, the patient complained bitterly of severe pain in the tempoparietal region of the right side. The pain was of a "sticking" character, as she described it, and toward evening had extended over the face, particularly in the region of the upper teeth. The patient was extremely restless and irritable; she did not attempt to sit up as on the days following the operation, but would lie with her eyes closed, and she took very little nourishment. The pulse, temperature and respirations were quite normal.

On October 17, the fourth day following the operation, and the twenty-fifth day since the onset of the otitis media, it was noticed that the child's eyes did not look quite right. They assumed a staring expression. On examination, a convergent squint was demonstrated which was associated with diplopia and vertigo. The right eye could not be rotated beyond the midline; in other words, a paralysis of the right external rectus was present. In the next few days, the paralysis had become much more complete. There was a continual blinking of the eyelids when the attempt to test them was made. Curiously enough, the intense spontaneous pain was disappearing although there was distinct soreness when the eyeballs were moved.

Examination of the eye condition by Dr. Cowan: "Restriction of movement in the sphere of action of the external rectus on the right side. Media clear. Disk margins slightly blurred, especially above. Color good. Scattered throughout the fundus are groups of round, well defined, various sized, choroidal pigment spots."

Neurologic examination by Dr. Yaskin revealed a right abducens paralysis as before noted, a partial paralysis of the left facial nerve, as shown by a drooping of the lip and a Babinsky sign on the left side.

The matter of treatment was now the all important problem. It was obvious that something had taken place which was involving the tissues around or near the tip of the petrous pyramid, a rather deep and inaccessible portion of the anatomy. Should we temporize and try watchful waiting, or was it better to operate and explore the structures involved? At this time the pain was less, and

the pulse, respiration and temperature were still normal, but the paralysis had apparently become greater. At the suggestion of Dr. Walter Roberts, who saw the patient, it was decided that she be left alone and nothing radical attempted for at least forty-eight hours. At the end of this period, a slight improvement was noticed, which in several days became more decided. The drainage from both ears had now ceased, and the patient took nourishment better and was sleeping well. A wider range of motion of the right eyeball was observed. The diplopia gradually grew less, finally disappearing on the twelfth day following the operation. She was discharged from the hospital on October 25; six weeks later no trace of paralysis remained, nor was there any evidences of the apparent pericarditis and pyelitis.

SUMMARY

In the summary of this case, there are several outstanding features which merit our attention.

1. The previous medical history of the patient. Here a tendency to frequent attacks of bronchitis and even pneumonia was disclosed, which indicated lowered vitality and resistance. A search of the literature revealed that most of the cases reported showed the same poor protection against infection. This is evidently an important factor in the formation of the condition.

2. The severe tempoparietal pain and the pain over the teeth. This was explained by the nearness of the gasserian ganglion to the abducens nerve. The presence of this symptom is significant, and practically pathopneumonic of Gradenigo's syndrome. When it occurs in connection with acute otitis media, the true nature of affairs should be suspected even before the paralysis takes place.

3. The extreme pneumatic character of the bone found when the cortex was removed. This is quite interesting, and since the majority of observers have reported similar findings, it evidently plays an important part in the pathogenesis of the condition. The reason, of course, being that the large pneumatic cells offer very little resistance to the spread of infection to the tip of the petrous portion of the temporal bone.

4. The lack of pathologic changes present when the mastoids were uncovered. This merely proved what others have discovered, namely, that this syndrome can and does occur even in ordinary cases of acute otitis media, without the mastoid necessarily going on to suppuration. However, in our case, the drainage of the mastoids was followed immediately by a drop in temperature.

5. The problem of treatment. There is no doubt that a paralysis of the abducens may occur in grave conditions such as suppurative meningitis, brain abscess and sinus thrombosis, and of course in these instances a radical operation is imperative, but in the Gradenigo syndrome the abducens is affected because the petrous tip is involved, and since the prognosis in the great majority of cases is good, the treatment should be along conservative lines. Naturally, the exact diagnosis is essential. A careful review of the history and symptomatology will help to shed the proper light on the subject.

1714 Pine Street.

CHOLESTEATOMOTITIS

MYRON METZENBAUM, M.D.
AND
OSCAR EISINGER, M.D.
CLEVELAND

REPORT OF CASE

History.—A man, aged 37, was referred to our office on April 25, 1925. At the age of 9, he developed acute otitis media of the right ear and a fistula of the right mastoid which discharged for a considerable time; the fistula then healed spontaneously but the middle ear discharged continuously since. Eight years prior to examination, at the age of 29, the patient developed an acute exacerbation followed by an increased discharge of pus, and a complete paralysis of the entire right side of the face. After a time the ear discharge lessened, but the facial paralysis remained. During the last few years the patient suffered greatly from severe headaches. For three weeks before examination, the discharge from the ear increased, and he suffered from earaches; eight days before coming to us, a swelling developed at the back of his right ear (over the mastoid).

Physical Examination.—An emaciated and anemic-looking patient was seen, with a temperature of 37 C. (98.6 F.); the pulse was 80. The general examination was negative. There was a right-sided facial paralysis in all three branches. The right half of the forehead could not be wrinkled; the right eye could be closed only about one half; the right corner of the mouth hung down completely and could not be raised in the slightest degree.

The swelling at the back of the right ear over the mastoid extended forward over the zygomatic process. On the mastoid at a height corresponding to the antrum, there was the scar of the old fistula. Including the posterior border, the entire mastoid was quite sensitive to pressure. The outer ear canal was completely closed by a bag-like swelling hanging down from the upper posterior canal wall, in which there was probably a perforation. With a probe, the wall of this swelling was easily indented. It was impossible to obtain a view of the canal beyond. There was a moderate discharge of foul-smelling secretion.

Cochlea.—The Weber test sometimes lateralized toward the diseased side; more often toward the normal side.

Rinné Test.—The middle fork C^1, set into vibration just at the ear was not heard at all. When the C^1 fork was placed on the mastoid at was heard very well, therefore the Rinné test was absolutely negative. The Schwabach test was lengthened.

When the C^1 fork was struck forcibly, it was heard but only for a short period. C_{64} the low fork, was not heard at all. The small a^1 (Stenger's fork) was heard when struck forcibly.

With the Bárány noise apparatus in the normal ear, the patient heard with the diseased ear only very loud-spoken words, which he repeated incorrectly.

Vestibular Tests.—The caloric reaction test could not be made because the ear canal was closed so completely that not even an attic cannula could be introduced.

Turning Reactions.—Rotating the patient ten times to the right side showed horizontal nystagmus for nineteen seconds toward the left side; rotating ten

times to the left side showed horizontal nystagmus for eighteen seconds toward the right side. There was no fistula symptom, spontaneous nystagmus, past-pointing, dizziness nor vomiting.

Roengten-Ray Findings.—The right mastoid cortex was shell-like. All the mastoid cells were destroyed and seemed to be replaced by a benign growth. The left mastoid was normal.

Diagnosis.—There was acute exacerbation of chronic otitis media with a cholesteatoma. With this provisional diagnosis, the patient was sent to the Hospital Clinic for an immediate operation. The leukocyte count was 14,900.

Operation.—Under gas-ether anesthesia, the retro-auricular incision was made through the periosteum, including the old fistulous scar. On separating this, a foul-smelling subperiosteal abscess was opened; the mastoid cortex revealed numerous necrotic areas and a very large fistula in the region of the

Fig. 1.—Cholesteatom with matrix.

antrum. On removing the entire mastoid cortex, a large cholesteatoma was uncovered. This mass, including its matrix, which was the size of a pigeon's egg, was removed intact, revealing a completed natural, radical mastoid cavity. The posterior canal wall was completely resorbed. The middle ear, the antrum and the mastoid were transformed into a single cavity, just as we endeavor to do in a radical mastoid operation. In the middle ear there were granulations and foul-smelling cholesteatoma, which were curetted away. No remains of either the drum membrane or the ossicles could be identified. The horizontal semicircular canal appeared somewhat flattened, but no fistula could be seen. The facial nerve so far as the facial ridge could be seen, was not found exposed anywhere. About 1 sq. cm. of the dura of the middle fossa and about 1 sq. cm. of the dura of the posterior fossa as well as about 0.5 sq. cm. of the sinus, lay exposed and appeared slightly changed.

The tip of the mastoid was sclerotic, therefore, only enough was removed to make a good plastic operation possible.

Iodoform gauze packing was inserted and the wound was left wide open. On the following morning the patient was free from the former complaints. The temperature was normal, there was no nystagmus and the headaches were entirely gone. The patient was normal postoperative. On the fifth day, the dressings were changed and every second day thereafter.

At the end of the second week the patient was dismissed from the hospital, and at the end of the second month the retro-auricular incision was healed. There was a moderate discharge from the radical mastoid cavity, which showed a tendency toward epidermization. The facial paralysis remained unchanged. The patient gained in weight and returned to his work.

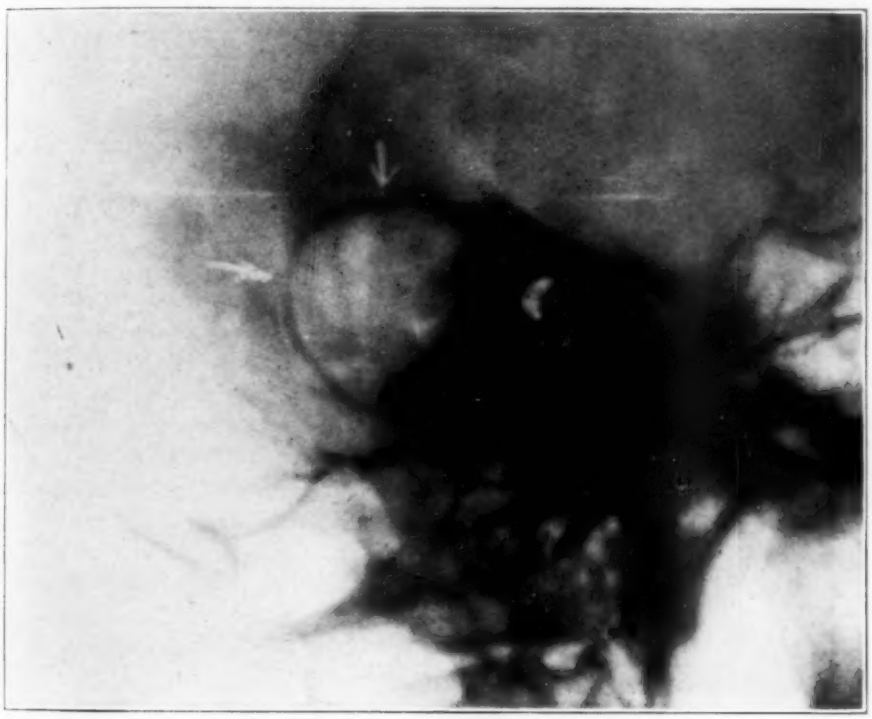


Fig. 2.—Mastoid cells replaced by cholesteatoma mass. Arrows indicate eroded areas.

SUMMARY

In this case, we were concerned with a patient who at the age of 9 years developed acute otitis media of the right ear, accompanied by the development of a fistula through the mastoid on a level of about the antrum. After a time, the fistula healed spontaneously, but the ear discharged for a period of twenty-eight years. About eight years prior to operation, the patient had an acute exacerbation resulting in a complete paralysis of the facial nerve in all of its three branches which remained

permanent. During the last three years he suffered from severe headaches, and during the three weeks prior to the operation the discharge from the ear increased. He suffered acute pains in and around the ear, and a swelling developed over the mastoid. The headaches became severe and the patient felt sick. These symptoms forced him to seek relief.

The operation uncovered an extraordinarily large cholesteatoma, which when its matrix was removed en masse, revealed an eroded area, 1 cm. in size, through the tegmen tympani, exposing the dura of the middle fossa; a second eroded area of 1 cm. in the posterior fossa exposing the dura of the posterior fossa; a third eroded area over the lateral sinus, a complete erosion of the entire posterior canal wall down to and including the facial ridge and a smoothing off of the horizontal semicircular canal.

The timely operation probably spared the patient intracranial complications, for it is now seven months since the operation and he is still well. The injury to the facial nerve is probably permanent.

COMMENT

This case demonstrates how extensive and destructive a middle ear infection may be without causing intracranial complications. In this case, nature performed the radical mastoid operation which probably saved the patient from some severe intracranial complication. Professor Neumann makes the comparison of a patient with a cholesteatoma to a man sitting on a barrel of gunpowder smoking a cigaret. The gunpowder may not explode, but just consider the consequences should it be ignited by the cigaret. A patient with chronic otitis complicated with a cholesteatoma which is producing symptoms, should be operated on, especially if paralysis of the facial nerve should develop during the course of an exacerbation. Though the diagnosis of otitic cholesteatoma was made clinically, it is of interest to state that the roentgenogram showed exactly the areas of destruction found at the operation.

736 Rose Building.

Clinical Notes

A NEEDLE GONE ASTRAY

SAMUEL COHEN, M.D.
PHILADELPHIA

A needle gone astray, especially in the human body, is always a matter to cause apprehension. When, however, a needle is lost in the throat, the possible dangers are self evident and are often of serious import. To have passed through an experience of this kind, searching for the needle and not finding it, is a distressing and a harrowing experience. The surgeon feels "down in the mouth," mortified, and the operating room staff seems to look on him as the guilty person. At that moment the surgeon wishes he had used a needle that cannot be lost, that is, one in which the needle and holder is a one piece instrument.

Needles, if held in a needle holder, should be held fast and not unlocked until it is certain that the other end has been securely grasped in a hemostat by the operator or by his assistant. If the hemostat slips and looses its grasp, be sure that both ends of the suture material are in the operator's grasp, otherwise one end of the suture material may be pulled out of the needle and the needle left in situ. Great care must be exercised when suturing within the throat. Instances of needles lost, even though temporarily, are rather frequent, when one converses with other operators on the subject. The following is an experience of mine.

REPORT OF CASE

E. P., a woman, aged 24, was having a tonsillectomy performed at the Polyclinic Hospital, on the service of Dr. G. B. Wood, on June 10, 1925. Ether anesthesia and the La Force instrument were used. After removing the right tonsil, bleeding occurred. The bleeding did not stop on using the ordinary methods of controlling hemorrhage, such as pressure, tannic and gallic acid, etc., and I decided it was best to suture.

With a threaded needle in my needle holder, I approximated the required area by getting the needle through it, and asked the physician assisting me (Dr. M.) to grasp the point (the free end of the needle had been pushed through the tissues). He said he had the needle point, so I unlocked the needle holder. Suddenly he said that he did not have the needle in the hemostat, and I pulled on the catgut in order to remove the needle and repeat its insertion through the tissues. To my amazement and horror, the catgut came out of the patient's mouth but no needle. My assistant was certain he saw the needle come out of the patient's mouth, which I had not.

We searched the throat, lifted up the uvula and the soft palate, palpated carefully all around and as far down in the throat as a finger could reach, but no needle was seen or felt. The tonsil fossae and pillars were again gone over carefully. The exterior of the patient, the clothing, the anesthetist, the operator and his assistants, the operating room floor, and even all the nurses were searched, but the needle was not found. During all this procedure, which must have taken about twenty minutes, the anesthetic was still kept up, the patient's head was kept bent backward and lowered, and suction was carefully used, hoping to help pick up the needle in that way. I then decided to have a roentgenogram of the patient made while she was still under the anesthetic.

The patient was removed to the roentgen-ray department, and plates were taken of the head, all of the neck, chest and abdomen, and she was then brought back to the operating room. The anesthetic was being administered all this time, and we waited for the plates to come back. Owing to the cooperation of

the staff of the roentgen-ray department of the Polyclinic Hospital, the plates were returned within fifteen minutes and showed the needle in the right lateral pharyngeal wall, behind the right choana. It was too high to be seen by lifting the soft palate, but on careful insertion of my finger I found it, embedded in the right Rosenmüller eminence. It was an easy matter to remove the needle, and the patient made an uneventful recovery, never having any knowledge, so far as I know, of the peculiar accident that occurred while she was undergoing the so-called, simple tonsillectomy. Time of operative procedure, loss and recovery of needle was one hour and ten minutes.

Peculiarly enough, six weeks after this occurrence, on July 22, 1925, my staff and myself were operating at the Northern Liberties Hospital. I was performing the local operations, and they were performing the operations under general anesthesia. A hemorrhage occurred, and the physician was inserting a suture, when he suddenly exclaimed "the needle is lost"; he began fishing for it, and kept constantly sponging. I asked him not to use sponges, only suction. However, he did not find the needle.

Remembering my previous experience, I just lifted up as much as possible of the soft palate with a large pillar retractor, and found the needle against the lateral pharyngeal wall; as in my case it was an easy matter then to grasp and remove it.

CONCLUSIONS

1. Whenever an accident of this kind occurs, search carefully the postnasal space, as it seems it is in this region that the object sought for will often be found.

2. Whenever possible, use a one piece needle and holder.

3. Never hold the needle at the eye, as it may break there and leave the rest of the needle in the tissues.

4. The needle should not be let go, either by needle holder or by hemostat, unless it has been removed from the mouth.

5. Keep the patient's head lower than the body (down and back) when operating in the throat, so that if a needle or other object is lost, it will not easily be sucked into the esophagus.

6. When searching for a lost needle, do not poke around forcibly. Sponge as little as possible, preferably not at all. Use suction, gentle palpation with the bare finger, and be especially careful not to forget the postnasal space. This should be examined very carefully.

2009 Pine Street.

LARYNGEAL STENOSIS*

HARRY MEYERSBURG, M.D.
BROOKLYN

Report of Case

History.—E. B., a woman, aged 37, married, a governess, was referred to me by Dr. Richard H. Bennett on Dec. 21, 1923, at the Long Island College Hospital. The chief complaint was choking and asthma.

Present Illness.—One and a half years prior to examination, the patient had a nervous breakdown and was obliged to give up work for a period of six weeks. About one year before examination, she began to lose weight (36 pounds, 16.3 Kg.). At that time the breathing became labored, and she

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* From the Department of Otolaryngology, Long Island College Hospital.
* Read before the Section on Otolaryngology, Kings County Medical Society, Dec. 9, 1925.

was removed to the Good Samaritan Hospital in Los Angeles, where the condition was diagnosed as chronic bronchitis brought about by her anemic condition. The patient remained in this hospital for a period of ten weeks, and was discharged unimproved, with the diagnosis unchanged. The labored breathing was not relieved by treatment with epinephrine. In April, 1924, she came East. For about six weeks the attacks were less severe. She then went to Sullivan County for five months, where the attacks were more frequent and more severe, and were not helped by codeine; loss of weight continued. Five weeks before admission to the Long Island College Hospital, she was being treated in New York for asthma. She complained on and off of pains in the throat, cough and expectoration of small amounts of blood-streaked sputum.

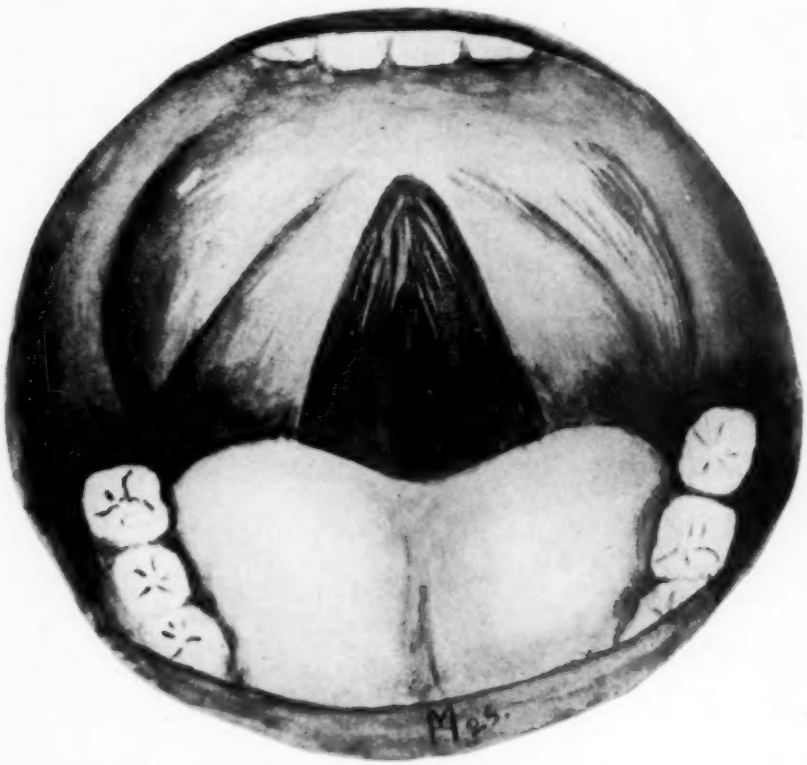

Fig. 1.—Showing absence of uvula, part of velum and tonsils.

Lately, she did not seem to be free from the attacks at any time. Just prior to admission to the hospital, the choking sensation was so severe that she was sent to the hospital as an emergency case.

Physical Examination (Abstract).—"The patient is a female adult, emaciated, anemic, and gasping for air. There is very marked supraclavicular, suprasternal and intercostal retraction. The pupils are regular and react to light and in accommodation. Examination of the nose and ears shows no pathologic changes. Examination of the mouth shows the tongue to be dry and coated and the mucous membrane of the mouth and pharynx dry and glazed looking. The uvula is absent. The tonsils are absent (not due to surgical removal). Velum, pillars and tonsillar areas seem all involved in a smooth, pale, radiating

cicatrix (fig. 1). A good deal of the mucosa of the posterior pharyngeal wall seems to be replaced by scar tissue.

"Laryngoscopy shows absence of the epiglottis, a good deal of scarring of all the hypopharyngeal mucosa, and practically total obstruction of the larynx by a cicatricial web extending over the brim of the larynx, apparently obliterating even the prominent arytenoids. At about the center of this bulging scar there is an opening the size of a pin point, through which the patient is obliged to breathe" (fig. 2).

Examination of the patient by Dr. Bennett was as follows:

"The patient is a woman of about 37; when seen, she was sitting up in bed and showing marked orthopnea. There is marked cyanosis of the ears, lips and fingertips.

"Thorax: This is very much emaciated. The ribs are prominent, the intercostal spaces are deep. On inspiration there is a retraction of the intercostal spaces over the lower portion, especially in both axillae. The supraclavicular spaces are also very much retracted on inspiration. All accessory muscles of respiration are used to a marked degree. Respiratory rate, 16 per minute. On

Fig. 2.—Laryngoscopic image before operation.

percussion, the note is resonant throughout the front and back; the breath sounds are prolonged, especially expiration, and inspiration is high-pitched. A few sibilant and sonorous râles are heard, which are not localized.

"The heart, abdomen and extremities are normal except for emaciation."

Roentgen-ray examination of the chest showed no definite pathologic changes except some increased aeration and definite depression of the diaphragm on both sides. The Wassermann reaction was negative.

The blood pressure was 94 systolic, 70 diastolic. The red blood count was 3,710,000; hemoglobin, 85 per cent. Aside from the low specific gravity, the urine was essentially negative. The blood chemistry showed very little deviation from the normal.

Tracheotomy was performed the day the patient was admitted to hospital. She was discharged from hospital Friday, Jan. 4, 1924. At this time her weight was 98½ pounds, an increase of about 10 pounds over her weight on admission.

On May 5, under local anesthesia, an attempt was made to resect the scar from above. Because of the density of the scar, this method was abandoned in favor of thyrotomy. On June 23, the patient was again admitted to the hospital for a radical operation. On June 26, under general anesthesia

(chloroform and ether), administered through the tracheotomy tube, a linear vertical incision was made in the median line from the hyoid above to the crycoid cartilage below. The thyroid cartilage was exposed; the thyrohyoid and cricothyroid membranes were brought into view. A median incision was made through the thyroid cartilage and the thyrohyoid membrane was incised up to the hyoid bone. The wound was gently retracted, exposing the larynx and a dense scar at the laryngeal brim, which was found to be 1.5 cm. thick and rather firm in consistency. This scar was removed and the underlying tissues were ligated. A piece of rubber tubing one-half inch in diameter (inside measurement) was inserted through the thyrohyoid membrane just to a point slightly below the laryngeal brim. The end of this tube was previously cut at an angle so as to prevent pressure on the laryngeal wall (fig. 3). Rubber tissue drains were inserted above and below the tube. The tube was then

Fig. 3.—Shows position of soft rubber tube.

anchored with figure-of-eight silkworm sutures, including the skin. A safety-pin was passed from the skin through the tube and the skin of the opposite side. The skin incision was closed with a few interrupted silkworm gut sutures. In order to prevent infection in the larynx itself as far as possible, a stomach tube was introduced and fixed in place. In addition to the regular nourishment, glucose was given intravenously.

The highest temperature recorded after operation was 101.4 F.; this was on the second and third days postoperative. The temperature returned to normal on the eighth day and remained so until the day of discharge, July 9. The skin sutures were removed the third day after operation; the stomach tube was removed the same day and the patient was allowed sterile fluids by mouth. The drain around the tube was partly removed the fourth day, and the patient began to experience some difficulty in swallowing. The stomach tube, however, was not re-introduced, although some cough followed each effort at swallowing. On the eighth day postoperative the large rubber tubing was removed;

on the following day the patient was allowed up in a chair. There was great improvement noted immediately after removal of the tube.

While infection by nonvirulent organisms did take place, yet the wound healed kindly in less than three weeks from the day of operation, and the patient was discharged from the hospital on July 9. The treatment was continued outside the hospital. She was allowed to wear a tracheotomy tube until December, 1924, at which time a cork was placed in the mouth of the tube and the patient was allowed to go about and even to sleep with the tube closed. After this period, the tube was removed and despite the fact that a window resection of the tracheal wall had originally been performed and that the tube had been worn for about six months, yet the tracheal wound was found completely closed in less than a week. The patient had a good speaking voice two weeks after operation.

While the laryngeal opening is about large enough to admit a lead pencil, its size has not varied appreciably in the last fifteen months, and it has not been found necessary to resort to postoperative dilatation at any time (fig. 4).

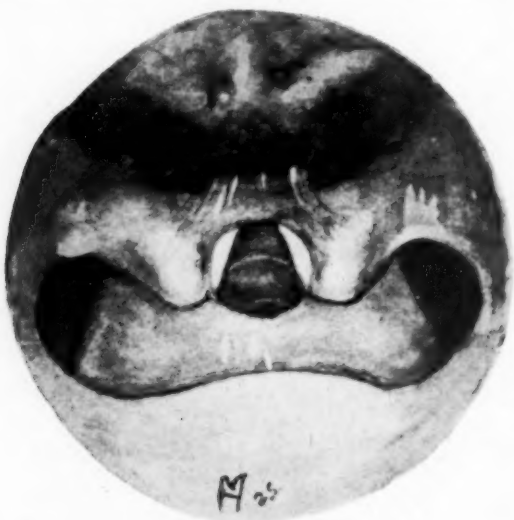

Fig. 4.—Laryngeal image fifteen months after operation.

Although the patient has contracted an upper respiratory infection on three occasions since the time of her operation, she has at no time experienced any difficulty or even slight embarrassment in breathing. Despite the fact that she has no epiglottis and that a great part of the defensive mechanism of the larynx is still included in the old cicatrix, she has not once complained of the paroxysms so commonly seen when food enters a larynx.

In addition to the operative treatment, Dr. Bennett administered three full courses of specific medications, beginning in January, 1924, consisting of 6 injections of neo-arsphenamine, each of 0.6 Gm., at weekly intervals and with approximately three months between courses.

Following the arsphenamine treatment, the patient was given a series of forty-two rubs, six each week for seven weeks, and with this, 15 grains of potassium iodide by mouth, three times daily, increasing 1 grain per dose daily until a total of 180 grains daily were being given. The last course was given in June and July, 1925. The Wassermann reaction before and after each course of treatment was negative.

This patient expects to enter the hospital again in the near future, when I will perform a plastic operation to remove the scar and to relieve the tension of the skin which is adherent at the upper extremity of the incision.

COMMENT

While I do not recommend this procedure in every case of cicatricial laryngeal stenosis, I do believe that it is applicable in such a case as is herein described. In this subject, the introduction of a tube into the larynx from above, I feel rather sure, would have resulted in interference with, if not complete destruction, of the delicate function of that organ.

338 Clermont Avenue.

AN UNUSUAL CASE OF TUMOR OF THE EUSTACHIAN TUBE

JOHN G. HUNT, M.B.
LONDON, ONT.

Mrs. M., aged 65, consulted me in regard to tinnitus and poor hearing in the right ear.

On examination of the ear, the drum was negative except for slight sclerosis of the membrane. The nose and throat were negative, until on inserting the nasopharyngoscope, I observed the mouth of the right eustachian tube to be filled with a pearly tumor, extending about one-quarter inch into the nasopharynx. That it did not completely occlude the tube was demonstrated by the fact that the eustachian catheter could be passed all around it, and air on inflation entered the tympanum.

Tumor which was removed from the eustachian tube.

The removal of the growth, which more or less resembled a miniature turnip, was no easy task, but after a number of unsuccessful attempts, by means of a postnasal forceps steadying the growth, a loop of nasal snare wire was passed over the head of the growth, evulsing it completely.

Dr. Luney, the pathologist at the University of Western Ontario, reported the growth to be a simple fibroid tumor showing no evidence of malignancy, which, considering that there has been no recurrence in four years, confirms the fact.

LATERAL TILTING TABLE

SAMUEL IGLAUER, M.D.
CINCINNATI

This table was designed for the special purpose of permitting lateral tilting of the trunk of the patient.

The head and back rest revolve around a pivot in the center of the table, and this permits the head and trunk of the patient being bent to the right or left while the back is at any degree of inclination desired. This feature enables the operator, who stands at the side of the table, to bring the site of operation in front of him, thereby relieving much of the strain of leaning over the table.

Lateral tilting table.

In mastoid surgery, the head can be brought immediately under the operator, permitting an easy and natural position.

In bronchoscopy, it is often desirable to move the head and shoulders up or down or to right or left. This is easily accomplished without lifting the patient. The table or chair position has also been found useful in dentistry.

The back rest is supported by a cog-wheel mechanism, so that it is firmly held and cannot slip. The patient may be placed in any desired position as with an ordinary table.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

TONSILS AND ADENOIDS

ARTHUR W. PROETZ, M.D.
ST. LOUIS

Perusing the tonsil literature is like attending a reunion. All the old faces are there. All the old platitudes come forth, bravely attired and but thinly disguised in grace of gesture and great solemnity of expression. Considering the great bulk of writing, there is a distressing paucity of ideas and personal observations. It is the exceptional paper which contributes anything beyond a rehash of its own bibliography.

My résumé of the literature of 1914 [1] took the form of a critical review. As the trend of opinion in regard to tonsil problems changes but slowly, another such detailed discussion at this time would seem to lack point. The material has been arranged, therefore, to facilitate reference to the articles themselves. No attempt is made to supply a complete list of titles, as their name is legion, but a representative selection comprises each group.

This year, as before, the preponderance of writing deals with case reports and with methods of treatment.

EMBRYOLOGY, HISTOLOGY AND ANATOMY

Bone and Cartilage in the Tonsil.—Reder [2] reports a case of bone and cartilage in a tonsil of a patient, aged 24. He believes that his case strengthens the theory that bone and cartilage in the tonsil are the results of metaplasia, but accepts the possibility of their being embryonic rests.

Patches of Ossification in the Tonsils.—De Crespigny [3] reports one case.

Anatomy of the Tonsillar Capsule.—Marx [4] denies the existence of a proper tonsil capsule. That which we are accustomed to term a

1. Proetz, Arthur W.: Tonsillitis and Tonsillectomy: A Review of the Literature of 1924, Arch. Otolaryngol. **1**:423-443 (April) 1925.
2. Reder, M.: Laryngoscope **35**:50, 1925.
3. De Crespigny, F. C.: M. J. Australia **1**:377, 1925.
4. Marx, Fritz: (Folia Oto-laryngol.) Ztschr. f. laryngol., rhinol., etc., **13**: 325, 1925.

capsule is in reality a dense fascia covering the buccopharyngeus muscle, which is intimately bound to the tonsil. This is in accord with the findings of Israel (footnote 9).

PHYSIOLOGY

Physiology of the Tonsils.—Nussbaum [5] gives a fairly complete review of the better known experiments in tonsil physiology.

Size of the Tonsils in Relation to Age.—Schönberger [6] divided the tonsils into five groups according to their size, and noted the relations of these groups to the ages of the patients. At 3 months, 94.5 per cent remained embedded; at the end of 3 years, hypertrophies occurred in greatest number, and at 4 years 11 per cent were found to meet in the midline. Another "peak" occurred at the end of the ninth year. After 18 years, no hypertrophies began. No differences between the sexes were noted.

These figures are only partially in accord with the findings of Cronk [7] reviewed last year.

Present Status of Lymphoid Tissue Problems.—This was reviewed by Heiberg [8] in 1924.

PATHOLOGY AND BACTERIOLOGY

Microscopic Study of Excised Tonsils in Relation to Tonsillectomy.—From an examination of 172 tonsils, Israel [9] concludes that few are removed which are entirely free from muscle tissue. Small fragments are impossible to avoid and are of no consequence, although the severity of postoperative pain and deformity is somewhat dependent on the amount removed. Postoperative hemorrhage depends largely on the distribution of vessels in the individual case and not on the technic employed. In this series, the dissection operation yielded the greatest percentage of complete removals. The author maintains that a true tonsillar capsule does not exist.

New Studies in Lacunar Tonsillitis.—Grossman and Waldapfel [10] discussed this subject in 1925.

Pathological Anatomy of Tonsils in Chronic Endocarditis and Rheumatic Fever.—Heiberg [11] makes a plea for the phagocytosis theory of tonsil function.

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5. Nussbaum, D.: Laryngoscope **35**:359 (May) 1925.
6. Schönberger, Margarete: Ztschr. f. Kinderh. **39**:367, 1925.
7. Cronk: Lancet **2**:904 (Nov.) 1924.
8. Heiberg, K. A.: Acta Otolaryngol. **7**:3, 1924.
9. Israel, Sydney: Ann. Otol., Rhinol. & Laryngol. **34**:79 (March) 1925.
10. Grossman, Benno; and Waldapfel, Richard: Monatschr. f. Ohrenh. **59**: 637, 1925.
11. Heiberg, K. A.: Virchows Arch. f. path. Anat. **257**:1, 1925.

Direct Blood Stream Infection Through the Tonsils.—Clinical evidence is given by Tanaka and Crowe [12] that many systemic disorders secondary to tonsillitis are due to the localization of bacteria in the affected areas. This is supported by the observation that the large collecting veins which empty the capillaries of the crypt epithelium lie just under the basement membrane, and become thrombosed when ulcers of the membrane occur. Emboli from this source escape into the blood stream. Excellent illustrations accompany the article.

Plasma Cells in the Tonsils.—Di Donato [13] reported a series of thirty tonsils sectioned; four from syphilitic patients showed plasma cells in large numbers.

Hypertrophy of the Tonsil in Infants and in Children.—Pirquet [14] reported "maxima of hypertrophy" in children coming for tonsillectomy; the first at 4, the second at 10 years. Two other maxima occur in adults at 18 and 30. Among these patients males predominated in the 4 year maximum; females in the other three.

Incidence of Infections in Tonsillectomized Children.—Kaiser [15] reports comprehensive observations on a series of 1,200 children on whom tonsillectomy was performed, and a comparison with a similar number of children of the same ages on whom operation was not performed.

Tuberculosis of the Tonsil.—Morgan [16] reports an interesting case in which the tonsil of a Chinese, aged 48, was infected with tuberculosis. A deep and extremely painful ulcer involved the left tonsil and the palatopharyngeus. There were healed lesions of both pulmonary apexes (seen by roentgen ray). Apparent recovery followed the tonsillectomy. Three months later, ulcers recurred, involving tonsillar fossa and pharyngeal wall. These disappeared with rest, brought about by feeding through an Einhorn tube, but four weeks later the patient died of hemorrhage during a severe pulmonary exacerbation.

Mixed Connective Tissue Tumors.—Beck [17] reports a case of lipomyxoma occurring in a tonsillar fossa several months after tonsillectomy.

The Recognition of Benign Growths of the Tonsil.—Three cases are reported by Silbiger [18]: (1) fibroma durum; (2) accessory tonsil, and (3) cyst of the tonsil.

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12. Tanaka, M., and Crowe, S. J.: Arch. Otolaryngol. **1**:510 (May) 1925.
13. Di Donato, Donato: Rinascenza med. **2**:280, 1925.
14. Pirquet, C.: Ztschr. f. Kinderh. **39**:372, 1925.
15. Kaiser, Albert D.: N. Y. State Med. Jour. **25**:469, 1925.
16. Morgan, J. A.: Laryngoscope **35**:368, 1925.
17. Beck, Karl: Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres. **21**:264 (Nov.) 1924.
18. Silbiger, Benno: Ztschr. f. Laryngol., Rhinol. **13**:217, 1925.

Neuroglioma of the Lingual Tonsil.—Kogan [19] reports a tumor of the lingual tonsil the size of a walnut, filling the left pyriform sinus. On section, it proved to be a neuroma, in which ganglion cells predominated.

Squamous Cell Carcinoma of the Tonsil.—Ross [20] reports a case, to which is appended a review of thirty-seven instances of malignacy of the tonsil. He states that death within two years is almost invariably the result.

Unusual Pharyngeal Lesions.—New [21] reports four cases of systemic disease, manifested first as lesions of the pharynx. 1. Chronic lymphatic leukemia, with nodular tumors in the pharynx and larynx. 2. Acute lymphatic leukemia, with ulcers of the mouth and pharynx. 3. Pharyngeal and laryngeal leprosy. 4. Pemphigus of the pharynx and mouth.

The Question of Vincent's Angina.—A statistical review of fifty-five cases is presented by Yakimoff, Jonkowsky and Schirwind.[22]

Pemphigus Beginning as a Tonsillar Manifestation.—Dintenfass and Greenbaum [23] reviewed this subject in 1925.

Abscess of the Lingual Tonsil.—M. F. Butler reports three cases and reviews the literature.

A Case of "Tonsillar" Fistula.—In Waring's [24] patient, a fistulous tract had its origin at the back of the left supratonsillar space, and opened onto the neck "at a point one-half inch above the clavicle and just external to the midline of the neck." The patient refused operation and further study was impossible.

A Case of Tonsillolith.—A tonsillolith measuring 3.4 cm. and weighing 22 Gm. was reported by Huizinga.[25]

COMPLICATIONS

Fatal Case of Peritonsillar Abscess.—The complication of a case reported by Steurer [26] was a thrombus of the jugular vein, causing death. This author believes the thrombus reached the jugular by extension from the smaller veins contiguous to the abscess.

Jugular Thrombosis Following Tonsillectomy.—Goodman [27] reports a case in which jugular thrombosis followed five days after the dis-

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19. Kogan, L. N.: Russkaja Otolaryngologia **1**:400, 1924.
20. Ross, Martin: Laryngoscope **35**:15 (Jan.) 1925.
21. New, Gordon B.: Arch. Otolaryng. **1**:384 (April) 1925.
22. Yakimoff, W. L.; Jonkowsky, A., and Schirwind, S. L.: Bull. Soc. pathol. exot. **18**:304, 1925.
23. Dintenfass, H., and Greenbaum, S. S.: Laryngoscope **35**:758 (Oct.) 1925.
24. Waring, J. B. H.: Laryngoscope **35**:444 (June) 1925.
25. Huizinga, Eelco: Arch. f. Ohrenh-, Nasen- u. Heilk. **113**:176, 1925.
26. Steurer, O.: Ztschr. f. Laryngol., Rhinol. **13**:322, 1925.
27. Goodman, C.: Ann. Otol., Rhinol. & Laryngol. **34**:213 (March) 1925.

section of a tonsil which contained an abscess cavity. On the evening of the operation, hemorrhage had occurred, which was controlled by local application of thromboplastin.

Hemorrhage From the Carotid Artery Accompanying Peritonsillar Abscess.—In Trutnev's [28] patient, necropsy showed an abscess behind the lower pole of the tonsil, extending to the carotid which was perforated near the bifurcation. The regional lymph glands had broken down.

Acute Pulmonary Abscess Following Tonsillectomy Treated with Artificial Pneumothorax.—Tewksbury [29] reports thirty-five cases successfully treated.

Tonsillitis as a Cause of Pyelitis.—Schaap [30] reports a case with obscure etiology.

Prolonged Coagulation Time in Hemorrhage Following Tonsillectomy.—Harter [31] reviewed this subject in 1924.

Tonsillitis as the Cause of Thyrotoxicosis.—In 1925, Bailey [32] reviews this subject.

Relation of Tonsil Infection to Nephritis in Children.—Symptomatology and diagnosis of nephritis in children differ from those in adults. Two cases are reported by Thorburn [33] to demonstrate the insufficiency of medical and dietetic treatment alone. The source of infection, sometimes found in the tonsil, must be eradicated.

Relation of the Nose and Throat to Endocrine Disturbances.—Relation, probably causal, exists between disturbances in the pharyngeal lymphoid ring and those of the ductless glands. Pituitary abnormalities, thyroiditis and ovarian dysfunction are especially prominent.

In Looper's [34] article, a bibliography of seventy-six titles is appended.

Intracranial Complications Following Peritonsillitis.—Wessely [35] presents two cases of intracranial infection following peritonsillitis, and eight additional cases from the literature are reviewed. The questions raised are: By what route does the infection travel? and are there more pathways than one? There appears to be no constant and trustworthy sign which might permit of timely interference. Treatment must be preventive, and consists of early evacuation of peritonsillar abscesses, without injury of the lateral walls. The cases cited include

28. Trutnev, W. K.: Russkaja Otolaryngol. **2**:101, 1925.
29. Tewksbury, W. D.: Ann. Clin. Med. **4**:350 (Oct.) 1925.
30. Schaap, C.: Nederlandsch. Tijdschr. v. Geneesk. **69**:2966, 1925.
31. Harter, John H.: Northwest Med. **23**:516 (Nov.) 1924.
32. Bailey, H. T.: Laryngoscope **35**:711 (Sept.) 1925.
33. Thorburn, O. L.: Ann. Otol., Rhinol. & Laryngol. **34**:1096 (Dec.) 1925.
34. Looper, E. A.: Ann. Otol., Rhinol. & Laryngol. **34**:785 (Sept.) 1925.
35. Wessely, Emil: Ztschr. f. Hals-, Nasen- u. Ohrenh. **9**:439 (Jan.) 1925.

cavernous sinus thrombosis, purulent meningitis, brain abscess, necrosing encephalitis and extradural abscess.

Blindness from Teeth, Tonsils and Accessory Nasal Sinuses.—The importance of early recognition of the site of infection is emphasized by White.[36] He again calls attention to the significance of the size and shape of the optic canal, which if it is too small, constricts its swollen contents. In severe optic neuritis, when one canal does not exceed 4 mm., the posterior sinuses should be ventilated unless some other definite focus is demonstrable.

Possible Means of Preventing Deep Cervical Abscess Following the Removal of Tonsils Under Local Anesthesia.—According to Chamberlin,[37] injection of anesthetic solutions into, or through the tonsil is dangerous. To avoid contaminating surrounding tissues, extremely superficial injections should be made at two points in the anterior pillar and another behind the superior pole. After two minutes the tonsil should be drawn from its bed and again injected, this time behind the lower pole and at a point opposite the middle of the tonsil.

PROGNOSIS

End-Results of Tonsillectomy.—Amsden [38] reviews this subject in 1925.

Effect of Removal of Tonsils and Adenoids on the Mental Development of the Child.—Angell's [39] deductions are based on observations of 50,000 school children. One fifth of this number had had their tonsils removed; 48 per cent of these were found to have improved mentally, although the physical improvement was more apparent.

Effect of Tonsillectomy on Existing Visceral Diseases.—Hand [40] reviews this subject in 1924.

TREATMENT

Tonsillectomy in Infants.—According to Ochsenius,[41] age should be no contraindication to tonsillectomy. In the case of an infant, tonsillitis recurred twelve times between the ages of 11 and 15 months. Entire freedom from sore throat followed tonsillectomy performed at this time.

Tonsillectomy and Adenoidectomy in Selected Cases During Primary and Secondary Infections.—Clarke [42] believes that certain types of acute angina with "threatening or developed atypical peritonsillar

36. White, Leon E.: Boston M. & S. J. **192**:64 (Jan.) 1924.
37. Chamberlin, W. B.: J. A. M. A. **85**:98 (July 11) 1925.
38. Amsden, H. H.: Laryngoscope **35**:382 (May) 1925.
39. Angell, E. B.: Arch. Neurol. & Psychiat. **13**:388, 1925.
40. Hand, Alfred: Internat. Clin. **4**:189 (Dec.) 1924.
41. Ochsenius, Kurt: München. med. Wchnschr. **72**:906, 1925.
42. Clarke, F. F.: Ann. Otol., Rhinol. & Laryngol. **34**:491 (June) 1925.

abscess" should have immediate operation. The same procedure applies to acute otitis media, mastoiditis and the acute exanthemas. It is not clear how patients are selected for this treatment, and the case reports do not convince the reviewer that the operation, and not some coincidental treatment, produced the results.

Treatment, Indications for, and Results of, in Chronic Tonsillitis.—Kelly [43] reviews the treatment of chronic tonsillitis in 1924.

Indications for Partial and Total Tonsillectomy.—In spite of his convictions, after visiting the American clinics, that the complete extirpation of the tonsils is no more dangerous than partial removal, Portmann [44] recommends partial removal in cases in which obstruction is the chief difficulty, and complete tonsillectomy for the diseased types.

Nonsurgical Treatment of Nose and Throat Diseases.—Goldsmith [45] gives a complete and careful résumé. The material is too varied and too abundant to be abstracted here. From Dundas Grant comes the quotation that it is "more creditable to cure a patient by medical measures than by the most brilliantly conceived operative procedures." This paper merits careful study.

Suction Tonsillectomy.—In Bailey's [46] experience, the suction and snare method of Waring is inferior to some of the ordinary measures in use. He could not substantiate claims made in its favor, and encountered disadvantages. He finds the dissection and snare method most to his liking, but recommends the Sluder method in selected cases.

A Plea for More General Use of Local Anesthesia in Tonsillectomy.—Barnes [47] gives a treatise on this subject in 1925.

Some Phases of the Tonsil Question.—A general discussion of diagnosis, prognosis and treatment is given by Newkirk.[48]

Septic Angina: Clinical and Therapeutic Observations.—This subject is discussed by Schmiegelow [49] in 1925.

Infection with Plaut-Vincent's Fusospirillar Organisms. Report of Cases with Lung Abscess Cured by Intravenous Injection of Neo-arsphenamine.—Spano [50] gives the case report of a boy, aged 11 years, who was cured by four intravenous injections of neo-arsphenamine at three-day intervals. The doses ranged from 0.1 to 0.3 Gm.

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43. Kelly, A. Brown: Brit. M. J. **2**:804 (Nov.) 1924.
44. Portmann, G.: Presse méd. **33**:49 (Jan) 1925.
45. Goldsmith, Perry G.: Ann. Otol., Rhinol. & Laryngol. **34**:727 (Sept.) 1925.
46. Bailey, F. W.: Laryngoscope **35**:161 (Feb.) 1925.
47. Barnes, Harry: Laryngoscope **35**:706, 1925.
48. Newkirk, H. D.: Laryngscope **35**:384 (May) 1925.
49. Schmiegelow, E.: Otolaryngol. Afd. Rigshosp. Kopenhagen **68**:11, 1925.
50. Spano, Rocco A.: Am. J. Dis. Child. **29**:621 (May) 1925.

Bismuth Therapy in Vincent's Angina.—Baranger and LeGoff [51] recommend treatment with arsenic or bismuth compounds, as being more penetrating and efficacious than methylene blue. Bismuth preparations are preferred because of their high metallic content and their more prompt control of pain.

Treatment of Vincent's Angina.—Immediate results are reported by Albernaz [52] in the treatment of Vincent's angina with solutions of sodium and potassium tartrobismuthate (from 1 to 3 per cent) in emulsion with olive oil. It is said to be free from danger in solutions as strong as 10 per cent.

Roentgen-Ray Treatment of Tonsils and Adenoids.—In MacCready's [53] case, examination after nine months showed a reduction in size of all treated tonsils. Bacteriologic study of eight cases, however, disclosed the persistence of hemolytic streptococci in the crypts. Microscopic examination failed to show any improvement in crypt drainage; an ulcer was found in one case. The conclusion is that while roentgen rays reduce the size of tonsils, they have no effect on drainage and inflammation in the remnant.

Tonsil and the Roentgen Ray.—Leof [54] reports thirty-six cases, of which 80 per cent are said to have been "dissolved" by the treatment.

Review of Radiotherapy for Tonsillitis.—The gist of Babcock's [55] paper is concisely expressed in its concluding paragraph: " . . . we cannot ignore the findings of careful investigators such as Trinder, who considers roentgen-ray therapy of value. On the other hand, much of the comment favorable to roentgen-ray therapy impresses one as being enthusiastic but not well controlled by careful observation. My own observations lead me to conclude that radiotherapy in chronic inflammation of the lymphoid tissue of the pharynx and nasopharynx, does not cause a disappearance or fibrosis of this tissue, render the crypts of the tonsil free from pathogenic bacteria or relieve the patient of acute local inflammation or the more remote symptoms due to absorption of toxins or bacteria from the tissue in question."

Surgical Diathermy Treatment of Chronic Tonsillitis.—Hofvendahl [56] recommends this method in subjects suffering from high blood pressure, anemias and tuberculosis, and for highly nervous patients who dread ordinary surgical procedures.

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51. Baranger, A., and LeGoff, J.: Arch. Internat. de laryngol., otol.-rhinol. **4**:840, 1925.
52. Albernaz, P. Mangabeira: Arch. internat. de laryngol. **3**:917, 1924.
53. MacCready, P. B.: Am. J. Roentgenol. **13**:424, 1925.
54. Leof, M. V.: M. J. & Rec. **121**:561, 1925.
55. Babcock, J. W.: Ann. Otol., Rhinol. & Laryngol. **34**:834 (Sept.) 1925.
56. Hofvendahl, Agda: Ztschr. f. Hals-, Nasen- u. Ohrenh. **9**:392 (Dec.) 1924.

NEW AND MODIFIED INSTRUMENTS

New and modified instruments are many and varied; an abridged list of them is given.[57]

57. Pearlman, Louis M.: A New Tampon for Tonsil and Adenoid Operations, Am. J. Surg. **39**:87, 1925. Fox, Noah: A New Tonsil Hook, Laryngoscope **35**:174 (Feb.) 1925. Yankauer, Sidney: A New Tonsil Irrigator, Laryngoscope **35**:234 (March) 1925. Layman, D. W.: The Layman-Storz Tonsillectome, Arch. Otolaryngol. **1**:422 (April) 1925. Beck, F. A.: Vacuum Tonsillectome, Laryngoscope **35**:371 (May) 1925.

News and Comment

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

The Pacific Coast Oto-Ophthalmological Society holds its annual meeting in San Francisco, April 26, 27 and 28, 1926. The American Board of Ophthalmic Examinations and the American Board of Otolaryngology plan to hold examinations in San Francisco in conjunction with this meeting. Those desiring to take these examinations should write immediately to Dr. W. H. Wilder, 122 South Michigan Avenue, Chicago, secretary of the Ophthalmic Board, or to Dr. H. W. Loeb, 1402 South Grand Boulevard, St. Louis, secretary of the Board of Otolaryngology.

AMERICAN BOARD OF OTOLARYNGOLOGY

Examinations will be held by the American Board of Otolaryngology in Dallas, Texas, on Monday, April 19; in San Francisco, California, on Tuesday, April 27, and in Montreal (Otolaryngological Clinic, Royal Victoria Hospital), on Tuesday, June 1, 1926. Applications should be made to the Secretary, Dr. H. W. Loeb, 1402 South Grand Boulevard, St. Louis, Missouri.

ANNUAL MEETINGS

The American Laryngological, Rhinological and Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, May 31 to June 2, inclusive. President, Dr. John M. Ingersoll, Cleveland, Ohio; Secretary, Dr. Robert L. Loughran, 145 West 58th St., New York City.

The American Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, June 2 and 3, 1926. President, Dr. Thomas J. Harris, New York City; Secretary, Dr. D. Harold Walker, 390 Commonwealth Avenue, Boston.

The American Laryngological Association will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, June 3 to 5, 1926, inclusive. President, Dr. Greenfield Sluder, St. Louis; Secretary, Dr. George M. Coates, 1811 Spruce Street, Philadelphia.

LOCAL SOCIETY MEETINGS

BALTIMORE: The Section on Otology and Laryngology, of the Baltimore City Medical Society, meets on the last Friday of each month, at 1211 Cathedral Street, at 8:30 p. m. Chairman, Dr. Sylvan Rosenheim; Secretary, Dr. Edward A. Looper.

CHICAGO: Chicago Laryngological and Otological Society meets on the first Monday of the month from October to May at the Crystal Room, Great Northern Hotel. Chairman, Dr. E. H. Norcross; Secretary, Dr. A. A. Hayden, 25 East Washington Street.

CLEVELAND: Ophthalmological and Otolaryngological Section of Cleveland Academy of Medicine meets on the fourth Friday of each month at the Winton Hotel. Chairman, Dr. E. W. Garrett; Secretary, Dr. M. Paul Motto, Rose Building.

DENVER: The Colorado Oto-Laryngological Society meets on the first Saturday of the month from October to May, at the Assembly Room, Metropolitan Building. President, Dr. William C. Bane; Secretary, Dr. C. Howard Darrow, Metropolitan Building, Denver.

KANSAS CITY, MO.: Kansas City Eye, Ear and Nose Society meets on the evening of the third Thursday of each month from September to May, at the Baltimore Hotel. The afternoons of the third Thursday of November, January and March are given over to clinical work. President, Dr. James May; secretary, Dr. A. E. Eubank.

MILWAUKEE: Milwaukee Oto-Ophthalmic Society meets on the third Tuesday of the month, at the University Club, at 6:30 p. m. President, Dr. John E. Guy; Sec.-Treas., Dr. John J. Brooks, Majestic Building.

NEW YORK: Otological Section of New York Academy of Medicine meets on the second Friday of each month from November to May, at 17 West 43d Street. Dr. James Morisset Smith, Chairman; Dr. J. L. Maybaum, 12 East 86th Street, Secretary. Laryngological and Rhinological Section of New York Academy of Medicine meets on the fourth Friday of the month from November to May, at 17 West 43d Street. Otolaryngological Section of the Kings County Medical Society meets on the second Wednesday of January, March and May, at 1313 Bedford Avenue, Brooklyn. Chairman, Dr. Harry Meyersberg; Secretary, Dr. Charles Breitman, 210 Brooklyn Avenue, Brooklyn.

PHILADELPHIA: Section on Otology and Laryngology of the College of Physicians of Philadelphia meets on the third Wednesday of each month from October to June, at 8:30 p. m., at the College of Physicians. Chairman, Dr. Fielding O. Lewis; Secretary, Dr. James A. Babbitt, 2117 Chestnut Street.

CORRECTION

Peroral Endoscopy.—In the review of Peroral Endoscopy, by Dr. Louis H. Clerf, in the March issue, the name "Moore," in the tenth line on page 268, should read "Moffit."

Abstracts from Current Literature

Ear

CONGENITAL ATRESIA OF EXTERNAL AUDITORY MEATUS. LEO DEUTSCH, Monatschr. f. Ohrenh. **9**:993 (Sept.) 1925.

Roentgenographic examination of seven cases of bilateral malformation of the auricula and external canal prompts the author to divide his findings into two groups. The first shows a hypoplasia of the os tympanicum and a compensatory hyperplasia of the surrounding structures, especially of the processus styloideus and the mastoid. Their enlargement is at the expense of the malformed tympanic bone. In the second group the atresia results from a concentric narrowing of the canal. Normally, the annulus tympanicus enlarges by bone deposition on its external circumference and by bone resorption in the internal lumen. If this ontogenetic sequence is disturbed, resorption may cease and result in the narrow constricted external canal.

RELATION OF LABYRINTH STIMULATION TO HEAD RESONANCE. T. DEMETRIADES, Monatschr. f. Ohrenh. **9**:1020 (Sept.) 1925.

In a previous report, the author demonstrated how section of the sympathetic nerve results in vasodilatation and consequent increase in head resonance. Warm fomentations or heat applied to the side of the head will produce a similar reaction. Calorization of the labyrinth with cold water gives an increased resonance on the side tested; while with warm water the increased resonance is on the opposite side.

The increase in head resonance is due directly to vasodilatation: this unilateral passive congestion occurs before the caloric nystagmus manifests itself, which fact inclines the author to suspect an intimate physiologic relation between labyrinth stimulation, intracranial circulation and nystagmus.

GLOWACKI, Detroit.

THE ROENTGENIZATION OF THE EUSTACHIAN TUBE. K. AMERSBACH and V. WUCHERPFENNIG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:173 (Dec. 8) 1925.

It is known that pathologic conditions which are based on inflammation or hypersecretion can be influenced by roentgenization under certain circumstances. Four years ago, Szász reported favorable results of tubal suppurations in children by this method. In Heidelberg, Beck mentioned that irradiation was used with patients who had undergone a radical operation. Szász used the rays from outward in front and behind the meatus, and on the projection of the tube on the arcus zygomaticus. This method was not successful with the authors. Irradiation of the tube from the mouth and pharynx without pushing the soft palate aside was used. A detailed description of the apparatus and of the localization of the tube follows.

The axis of the eustachian tube, in all three planes, points to the last molar of the upper jaw of the opposite side, or the place where it should be. Pathologic conditions in the nose and nasopharynx must first be attended to; it is not advisable to operate after irradiation, unless a sufficiently long time

has elapsed. It is entirely unknown whether other hypersecretory or inflammatory processes of the middle ear can be influenced, therefore it is better to confine the treatment to suppurations of the eustachian tube. With five patients the treatment was carried to the end. Among them were four who presented the cavities after radical operations, one in 1912, one in 1920, and two in 1923. The fifth case was a middle ear suppuration of tubal origin which had been treated for years without success. After the second irradiation the secretion was considerably less. Shortly after the fourth irradiation the ear became dry and remained dry. Among the four cases of radical operation, the oldest cases of 1912 and 1920 promptly became dry by irradiation. One of the subjects of 1923 had first had the treatment from the outside without success. After due intermission, roentgenization from inward resulted in drying the secretion of the tube after three treatments. The second subject, of 1923, did not show a result. The profuse secretion of the tube did not show any decrease. It is suspected that the patient encourages the suppuration by some means or other, as he is not interested in a cure.

Injuries of any kind have not been observed. A dryness of the irradiated mucous membrane of the palate occurs; the tube must be introduced sufficiently deep that the tongue does not interfere. If both sides are to be treated, sufficiently long intervals should intervene between the treatments of each side. A whole Holzknecht erythema dose was used, from 65 to 70 per cent at the pharyngeal portion of the eustachian tube and about 45 per cent of the dose at the tympanal portion. If the method is used practically as outlined, injury is excluded, yet smaller dosage should without doubt be used, if it can be done. Heidenheim has shown that smaller dosage is sufficient to impede inflammation. High dosages are not useful under these circumstances. It is impossible to carry a sufficiently large dosage into the depth when roentgenization is used from the outside in adults. This explains the difference of results compared with those of Szász in children. Further, the roentgenization from the mouth has another advantage, namely, certain parts of the nasopharynx are subjected to roentgenization and are influenced by the rays.

ANATOMIC FOUNDATION FOR THE APPROACH TO THE JUGULAR BULB. J. FEIERMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:260 (Dec. 8) 1925.

1. Surgical approach to the jugular bulb is made difficult by topographic and anatomic peculiarities (facial nerve), also by the variation in the development and location of the different parts in their relation to one another.

2. Efforts remained unsuccessful to determine a relation between the measurements at the base of the skull, which determine the approach to the jugular bulb, and the shape of the cranium in the sense of type anatomy.

3. It is not sufficient to consider the peculiarities of the skeleton when judging the usefulness of one or the other of the suggested surgical procedures. It is also necessary to take into consideration the total anatomic and topographic factors.

4. In choosing the one or other method of operation, the main consideration is the clinical analysis. Only this can decide whether a method can be used with the patient, or, whether it can only be used to make an anatomic specimen. This must be confined to a collection of anatomic specimens.

5. The operation, according to Grunert, is indicated in all cases from the anatomic standpoint as well as from the standpoint of clinical possibilities with which the surgeon may be confronted. The other methods can supplement the

methods of Grunert if it is necessary. Feiermann adds the following remarks to the technic of Grunert.

1. A second horizontal incision must be added to the incision behind the auricle in order to expose the whole mastoid process, including the posterior border after detaching the muscles originating therefrom (sternocleido, splenius capitus und longissimus).

2. In detaching the soft tissues from the bone layer by layer, an injury of the emissary vein must not be overlooked, although the stoppage of the hemorrhage is not so difficult at the exposure of the lateral sinus as it is at the approach to the cerebellum.

3. After the muscles originating from the process have been detached, after the digastric muscle has been cut and pulled downward, a good point of orientation is obtained in the transverse process of the atlas, which is covered by the muscles originating therefrom (m. rectus capitis lateralis, obliquus capitis superior, levator scapulae) and the fascia praevertebralis, which is easily palpated by the finger. The accessory nerve lies under this point, and is sometimes accompanied by the small sternocleido mastoid artery, a branch of the occipital artery. It is advisable to tie the occipital artery now. It runs under the transverse process of the atlas from forward and downward in a backward and upward direction.

4. It is advisable to remove the bones of the base from the soft tissues gradually; when approaching the m. rectus capitis the posterior surface of the vein must be detached from the anterior border of this muscle, and the vein must be cared for in the same way as the accessory nerve when it lies behind the vein. Then the muscles from the jugular process can be severed safely by penetrating from the vein backward into the depth until the raspatory meets the condyloid process. After loosening the muscle from the process, the posterior surface of the vein and the jugular process itself become visible.

5. The advice of Grunert, to apply the chisel parallel to the medium plane, cannot be carried out in a full measure, because in this case the incision through the soft parts would have to go too far backward.

6. When proceeding gradually, the removal of the transverse process of the atlas can frequently be avoided even in difficult cases.

7. In cases in which the osseous lamella which separates the sinus from the bulb is difficult to remove, there is no absolute necessity to remove it, because its presence does not prevent the approach to the bulb. It is even an advantage to leave it in place, because considerable time is saved which is important in operations of this kind performed on very sick people.

8. The advice of Tandler in regard to the facial nerve can be followed, because it makes the operation safer and because less time is consumed. It is not necessary to set the nerve free; it is only necessary to see where it is and to leave it in the surrounding gland.

NYSTAGMOGRAPHY DURING TURNING. J. I. GRUENBERG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:283 (Dec. 8) 1925.

1. The duration of nystagmus during turning is not constant in normal people. It varies between ten and forty seconds. In the majority of cases it is longer than twenty seconds.

2. Independent of the duration of nystagmus during turning, the nystagmus reaction after turning is always more pronounced than during turning.

REMARKS ON THE RADICAL OPERATION AFTER BÁRÁNY. LUDWIG SOYKA, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:291 (Dec. 8) 1925.

1. The Bárány method is an important addition to the therapy.

2. It is the method of choice in chronic middle ear suppuration with complications of the brain or sinus, and in radical operations in children.

3. In simple caries of the bone, the Bárány method should be considered because the duration of healing is shorter, and healing is more simple.

4. The Bárány method is less suitable in uncomplicated cases of cholesteatoma on account of the danger of recurrence.

5. In cases of cholesteatoma, with good hearing, the conservative radical operation appears to be the proper one.

6. The modified Bárány method can well be followed in caries of the bone with good hearing.

AMBERG, Detroit.

Pharynx

THE POSITION OF THE TONSIL PROBLEM IN THE LIGHT OF PRACTICE. THEODOR VON LIEBERMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:296 (Dec.) 1925.

The whole complex is far from having been studied sufficiently to furnish directions for practice. Von Liebermann states that crushing can do more harm than good. He saw, repeatedly, cases of acute nephritis after this procedure which could only be cured when the tonsils were removed. Furthermore, he does not recommend slitting, wiping and washing. Whether the occurrence of endocarditis, nephritic foci, pleuritis, septic infarcts, etc., must be attributed to the operation or to technical mistakes is difficult to decide. They can be avoided with more or less certainty. One should avoid carrying by puncture infectious material into the retrotonsillar tissue. The tonsil should not be squeezed or torn too much when one engages the same, and the wound should not be smeared with the infected parenchym in order to try and stop bleeding; then grave consequences may probably be avoided. Indirect damage is done when the operation and aftertreatment do not fit in the course of general medical treatment. The overnourishing of a patient suffering from tuberculosis might be interrupted by tonsillectomy with bad consequences for the patient, or a patient suffering from nephritis who is on a dry diet may suffer from the liquid diet after tonsillectomy. The danger of the operation is overestimated. The author is opposed to closing the wound by stitching. He does not consider it surgical, and it is quite injurious. All bleeding vessels, even the smallest, should be tied without acupressure. The author agrees with Blegvad that the many lung abscesses in America are due to the technic. He thinks that many such operations are done under general anesthesia and especially under too deep an anesthesia, which interferes with the cough reflex, that these operations are done very quickly and are accompanied by too much bleeding. Liebermann does not believe that the lung abscesses are caused by way of the lymph or blood stream, otherwise there would be more lung abscesses over there. It is a danger, he states, which can be avoided.

AMBERG, Detroit.

Larynx

CONTRIBUTIONS TO THE ANATOMY OF THE VOCAL CORDS. M. HAJEK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:161 (Dec. 8) 1925.

1. A very meager, loose propria is found under the epithelium of the labium vocale. It lies loosely on the elastic ligament of the labium vocale, and is rather sharply outlined upward and downward at the spot where the pavement epithelium changes to ciliated epithelium (linea arcuata superior and inferior). In the region of this loose subepithelial tissue, an artificial well defined edema can be created by injection of fluid (Reinke).

2. In the living, a subepithelial edema of the labium vocale can also be found, which is exactly confined according to Reinke (Hajek).

3. The polyps or the polypoid thickenings of the margin of the labium vocale are a product of the inflammation of this well defined subepithelial tissue layer, with secondary changes in the edematous tissue (Hajek).

CONTRIBUTION TO THE TECHNIC OF ENDOSCOPIC REMOVAL OF LARGER TUMORS OF THE TRACHEA AND LARYNX. R. GUMPERZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:316 (Jan. 18) 1926.

Gomperz devised an instrument which is a combination of a grasping forceps and a loop. The guiding tube of the grasping forceps is combined with the guiding tube of the wire loop. The latter tube is 1 cm. longer than the former. The instrument is introduced with opened loop and opened forceps. The loop is placed around the tumor, the forceps is closed and the tumor is caught. The forceps is kept closed automatically. This method should be modified according to the seat and size of the tumor. Tumors with a long stem must be caught with the sling and, at a favorable, moment grasped with the forceps.

CONCERNING THE REMOVAL OF THE TUBERCULOUS EPIGLOTTIS. E. BUECH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:342 (Jan. 18) 1926.

The importance of the removal of the epiglottis lies in the removal of the diseased tissue and in the prevention of the propagation of the tuberculous process. In cases in which the epiglottis is not diseased alone, a noticeable improvement of the general condition of the patient is found. This can be attributed to the circumstance that pain in swallowing and that swallowing the wrong way are diminished, or are entirely relieved. The patients have a greater desire to eat, which improves their physical and mental condition.

AMBERG, Detroit.

Nose

HISTOLOGIC AND HISTOCHEMICAL RESEARCHES ON NASAL POLYPI. GINO BUSACCA, Arch. ital. d. otol., rinol. e laringol. **36**:696-717, 1925.

From extensive histologic and histochemical researches on nasal polypi, Busacca concludes that they are not myxomas, edematous fibromas, nor simple growths of the nasal mucosa. In their tissue, while there was evidence of chronic inflammation, the characteristics of granulation tissue were not observed. In agreement with the conceptions of general histopathology, they may be the

result of slow chronic inflammation — the products of persistent stimuli of low intensity, in which at the beginning the typical exudative phenomena are not observed and which do not lead to the production of true granulation tissue but to a simple hyperplasia and hypertrophy of the connective tissue.

WOLCOTT, Chicago.

OPHTHALMOPLEGIA AND VISUAL DISTURBANCE FROM LOCAL ANESTHESIA AT AN OPERATION ON THE NASAL SEPTUM. MARSCHIK, Klin. Monatsbl. f. Augenh. **75**:476 (July-Dec.) 1925.

Marschik, at the Ophthalmological Society in Vienna, June, 1925, reported a case of sudden complete paralysis of the eye and blindness which, after half an hour, entirely cleared up. These disturbances followed the injection of 2 per cent procain-enpinephrin solution, and occurred in the eye on the same side as the injection. The author felt that it was a question of an injection into a septal vein from which the solution was carried into the cavernous sinus.

H. H. VAIL, Cincinnati.

ENDONASAL GIANT CELL SARCOMA. GEZA KALOCSAY, Monatschr. f. Ohrenh. **59**:1031 (Sept.) 1925.

In 1900, Kümmel collected seventy cases of nasal sarcoma, and in 1902, forty more were added by Gibb. Among all these only two giant cell sarcomas (Nelaton, Mason) were found. The author's patient, a girl, aged 7 years, presented a tumor of the left ethmoid, encroaching somewhat on the orbital cavity and producing exophthalmos and ulcus corneae and lagophthalmos. Thirteen roentgen-ray exposures were made, entirely shrinking the tumor mass. A suppurating fistula near the internal canthus was the indication for a radical external ethmoid operation. The patient could not be followed further.

ETIOLOGY OF DEVIATIO SEPTI. OSKAR HIRSCH, Monatschr. f. Ohrenh. **11**:1234 (Nov.) 1925.

In a supplementary statement to his extensive study of the causes of nasal septum deviation, Hirsch demonstrates another anatomic specimen to substantiate his former opinion. This is a skull of a new-born infant with bilateral cleft palate. The septum, with the premaxillae attached anteriorly, "hangs" freely from the roof of the nasal cavity; it possesses a marked deflection to one side. He reiterates his theory, that a study of embryo skulls and skulls of new-born infants leads one to conclude that anomalies in shape and position of the nasal septum are not due to pressure exerted by any of the adjacent bones, but that the anomaly inherently exists in the septum anlage.

GLOWACKI, Detroit.

CONTRIBUTION TO ROENTGENOGRAPHY OF THE NASAL ACCESSORY CAVITIES. HELMUTH RICHTER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:192 (Dec. 8) 1925.

The author gives a detailed description of new methods which he uses in the roentgenography of the sphenoidal cavity, the frontal sinus and the antrum of Highmore. The best pictures of the sphenoidal cavity made so far were obtained after the method Knick. After anesthetizing the pharynx, the small filmcassette is introduced into the mouth. According to Pfeiffer, the picture

is taken in a verticosubmental direction while the patient is lying down, and while the head is hanging down. Tschebull uses the central ray in a verticodental direction, while the mouth of the patient rests on the filmcassette.

The author tried his methods on the sphenoidal cavity and maxillary antrum of the prepared skull. The sphenoidal cavity was filled with barium mush. The best palatoparietal fixation direction was obtained when the occipital region of the head lies at the filmcassette 60 degrees backward. (The horizontal line is assumed to run in the direction of the zygoma.) The tube is raised 5 degrees upward. The central ray, looked on from the side, goes through the region of the second upper molar and from 1 to 2 cm. lateral from the outer orbital margin, viewed from above, in the median line of the skull. The tubes of a diameter of 12 cm. and of a length of 15 cm. were provided with a 5 cm. diaphragm, according to Voelger, the opening of which is located before the mouth which is kept open by a boiled cork. The upper incisors are still to be seen in the opening of the diaphragm. The time of exposure on the prepared skull was seven-tenths of a second. The filament current was set on number 41. The sphenoidal cavity is situated between the teeth of the upper jaw and is projected on the convexity of the skull. Exposures of sphenoidal cavities of the patients are reproduced. The patient can be in a sitting position. The frontal sinus exposures demanded the avoidance of the nasal root. The head of the patient was bent 60 degrees backward, the tube was directed 10 degrees upward. The central ray, viewed from the side, follows the direction of a line situated from 1 to 2 cm. above the root of the nose, and viewed from above, it travels in the median line of the skull. The frontal sinuses appear somewhat projected in width. The nasofrontal method is to be used when the occipitofrontal method is not sufficient. For the maxillary antrum the following method is used. The patient turns his face to the filmcassette and the head is turned 45 degrees downward. The tube remains in the original position. The central ray goes horizontally, viewed from the side, through the processus coronoideus of the lower jaw, viewed from above, in the median plane of the skull. Only the forehead lies on the filmcassette. The roentgen rays penetrate, besides the maxillary cavities, only the vertebrae and soft parts. On the prepared skull the exposure lasted eight-tenths of a second. The filament current was set on number 40.

Summarizing, the author states that the method described before furnishes useful results. The cervicofrontal exposure of the maxillary antrum which gives simultaneously a general view of the nasal accessory cavities, excludes the penetration of the bones of the convexity and of the base of the skull in the plane of the maxillary cavities and prevents errors more easily than the occipitofrontal exposure, in which cloudiness of the antrums of Highmore is not infrequently present in the absence of clinical symptoms and vice versa. An assymetry of the skull is not rare. The diploe is also not evenly distributed on both sides of the occiput, as can be seen when the prepared skull is held against the light. Besides these cervicofrontal general exposures, the palatoparietal exposure of the sphenoidal cavity and the nasofrontal exposure of the frontal sinus can be employed in special cases when the methods used so far are not satisfactory.

THE INFLUENCE OF LIGATION OF THE JUGULAR VEIN IN EXPERIMENTAL SINUS THROMBOSIS. W. UNDITZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:204 (Dec. 8) 1925.

1. Sinus thrombosis is more frequent than all other intercranial complications (more than 50 per cent of the complications belong to this class).

2. In about 50 per cent of cases with fatal outcome in consequence of ear troubles, sinus thrombosis is the cause, or it is the connecting link between suppurative otitis and other fatal complications.

3. Timely surgical interference in sinus thrombosis gives much better chances for recovery than in all other intercranial complications (meningitis, abscess, etc.).

So far, there is no uniformity of opinion concerning the ligature of the jugular vein and other numerous points. Oskar Brieger calls attention to the fact that the material of the various authors is too varied to draw conclusions. Gruenberg published the cases which had been observed in Wojatschek's clinic in the years 1917 to 1923. In twenty patients, the jugular vein was tied; in forty-one it was not tied. Of the first, 15 per cent were cured, of the latter, 60 per cent. The author mentions the experimental work of Stenger and that of Haymann. He also refers to the work of Schukoff, who experimented with the femoral vein of the rabbit with a culture of staphylococci. Of twelve rabbits whose veins were not tied all died; of ten rabbits, whose veins were tied, two died and eight lived. Such a favorable result could only be observed when infection and ligature were carried out simultaneously. If the ligature was done from four to eight hours after apposition of the packing, the influence was less noticeable. Of eight rabbits, four died. If the ligature was done twelve hours after the infection, it was of no influence. All four rabbits died. Schukoff could show that the venous congestion which followed the ligation influenced the virulence of the microbes. They became less virulent at the place of congestion. Unditz claims that the lateral sinus offers different anatomic physiologic conditions. According to Panse, the sinus serves to slow up the outflow in order that the brain has a uniform supply of blood. Unditz experimented with the sinus transversus of the dog and used the staphylococcus, the streptococcus, and a mixture of staphylococcus and streptococcus. Parallel experiments gave the following results:

	Died	Cured	Total
Without ligature	5	6	11
With ligature	5	6	11

1. In the animal experiment, a sinus thrombosis is created the best by apposition of infectious material. The pressure and duration are important, as Haymann has shown. A mechanical insult is not necessary.

2. The ligation of the main efferent vessels is not of noticeable influence on the course of the experimental sinus thrombosis. The general condition also was not influenced.

3. Experimental sinus thrombosis in the dog has a decided tendency toward self cure. Only very virulent cultures lead to death.

4. The effect of the microbes and their toxins cause various changes, which can be divided into three main groups: (*a*) the sinus wall is necrotic without formation of a thrombus. This is the most severe condition; (*b*) the wall of the sinus thickened. A white thrombus is formed, which consists mainly of layers of fibrin and bloodplatelets. It does not show any inclination toward suppuration and is soon organized. Clinically, these are the lightest cases; (*c*) the wall of the sinus is infiltrated by cells and inclines to a suppurative breakdown. A crumbling thrombus of red color is formed, which consists mainly of a mass of erythrocytes, between which a narrow layer of fibrin is interposed. The thrombus is permeated by numerous leukocytes. Mostly a suppurative breakdown results, more rarely an organization of the thrombus. These cases take a median position concerning the severity of the affection.

The various types are explained by the various degree of the virulence of the micro-organisms. With severe virulence the noxious influence can become so great that the wall of the sinus becomes necrotic in a very short time. A thrombosis does not occur. If the degree of virulence is less, the influence of toxins is less strong on the wall of the sinus. A suppurative inflammation results and a thrombosis quickly occurs (red thrombus).

5. Thombosis must be considered as a measure of protection in inflammatory processes of the sinus. Only under special circumstances can the thrombus itself become dangerous, for instance, if it comes to a suppurative breakdown. Naturally, experimental thrombosis in the animal meets with biologic and anatomic conditions other than in man. The method of infection by packing is not always comparable to processes in man. Yet, with some caution, some conclusions can be drawn concerning human pathologic changes also. The origin, the course and the morphology of sinus thrombosis does not offer a basic difference in animal and in man. Especially the sinus thrombi in the course of acute otitis media must be considered. Packing and perisinus abscess must have a similar effect. Unditz claims that in certain conditions ligation of the jugular vein is decidedly superfluous. The following course must be taken:

1. If in acute otitis media the sinus thrombosis (be it mural or obstructing) does not cause any general symptoms, then it is best not to manipulate the sinus. It must be laid bare until healthy tissue is reached and the focus of infection must be thoroughly removed. Cases of sinus thrombosis with an organized thrombus have been described by Mahler, Miodowsky, Chatellier and others. They occur probably frequently and are overlooked because they often take a course without symptoms.

2. If general symptoms are present, the focus of infection must be removed, the wall of the sinus must be bared until healthy tissue is reached, and the thrombus must be removed as far as it shows signs of breaking down. This must be done very carefully. Portions which stick and the ends of the thrombi should not be touched.

The animal experiment does not furnish the analogy with sinus thrombosis in chronic otitis. Here the thrombus must be removed as radically as possible. It is essential to operate before the virulence of the micro-organisms becomes too great. Unditz thinks that ligation of the jugular vein is useless as a means of closing the blood current because other channels remain open. The jugular vein should only be tied when the suppurative inflammation extends to the jugular vein itself, or when the bulbus should be drained also from below. According to Wojatschek, early operation and timely elimination of the primary focus are the main conditions for success.

CHANGES OF THE MUCOUS MEMBRANE AND OF THE CARTILAGE IN RHINITIS SICCA ANTERIOR. A. ESCH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:238 (Dec. 8) 1925.

The exudative processes lead to the destruction of the epithelium, and regeneration of the epithelium sets in from the border. This regeneration does not confine itself to the formation of normal epithelium, but leads to entirely atypical proliferation of epithelium with superficial cornification. This is a process which is also observed in the pavement epithelium in other parts of the body in long lasting inflammatory irritation, for instance, in atypical

proliferation of the epithelium in the depth of the outer ear canal in chronic middle ear suppuration. In rhinitis sicca, the changes of the epithelium in connection with the loss of glands, explain the tendency to crust formation in the region of the scar. Furthermore, histologic investigations by the author show that, in rhinitis sicca anterior, cartilage can quickly be destroyed at a circumscribed spot by toxic influences in the stage of fresh exudate inflammation. Necrotic cartilage is resorbed and is broken up by leukocytes, wander cells of connective tissue, and fibroblasts. The defect of the cartilage can be filled by cicatricial tissue so that a perforation of the septum does not occur. This is, however, only possible if the soft parts of one side have not been destroyed. Esch has not seen in his specimens some pictures found by former investigators. Some can surely be observed in rhinitis sicca anterior, for instance, a demarcation by granulation tissue which can be looked on as a transitory stage when viewed from the point of his investigations. If Esch missed this finer transitory stage it must be attributed to his material which was obtained, accidentally, in operations. In order to obtain all details, the experiment must be resorted to, when time, infection, mechanic and thermic irritations can be modified. It is questionable whether other findings can be expected, for instance, resorption by chondroclasts, giant cells, which can be formed by cells of the cartilage, or the connective tissue. Hosomi also did not observe any resorption by polynuclear chondroclasts. The investigations of Hosomi and those of Esch refer to outspoken inflammatory processes. This explains the absence of chondroclasts. Lang, who found them, had examined the cartilage of the joints in arthritis deformans and osteochondritis dissecans. In these conditions the inflammation is less pronounced.

AMBERG, Detroit.

Miscellaneous

SKEW DEVIATION. OSKAR MAUTHNER, Monatschr. f. Ohrenh. **59**:1177 (Nov.) 1925.

Vertical divergence of the eyes has been reported by Pötzl and Sittig, and Holmes and Ballance, in association with lesions of the vestibular nucleus and connecting tracts to the third and sixth nuclei. The author reports its occurrence in true hysteria. A girl, aged 18, suffered attacks of unconsciousness from a time when she was severely frightened by lightning. While in a semiconscious state, calorization with cold water was done, and a vertical deviation of the eyes was observed. After a ten minute interval, similar calorization brought out the same manifestation. On regaining consciousness, and on the following day the skew deviation could no longer be elicited. The author is not inclined to attribute this symptom to any central organic affection, but suggests that it might be considered as a neurosis in the region of the vestibular nucleus.

TREATMENT OF TUBERCULOSIS OF THE UPPER RESPIRATORY TRACT WITH AN IMPROVED CARBON LAMP. EMIL WESSELY, Monatschr. f. Ohrenh. **59**:1180 (Nov.) 1925; ibid, p. 1263 (Dec.) 1925.

A résumé of Wessely's five years' experience with his carbon arc lamp is given in the treatment of tubercular lesions of the nose, mouth, pharynx and larynx. The source of light is a carbon-coal lamp (the carbons improved

by impregnation with metal salts: Goertz), and a converging lens of mountain crystal. Figures are included, demonstrating that this light approaches nearest to the sun in every segment of the spectrum.

Local irradiation is made directly on the lesion or indirectly by the use of a nickel or a nonrust Krupp steel mirror. Other materials have been found either to have poor reflection qualities or too great absorptive power. The larynx may be exposed with a suspension laryngoscope, or reached indirectly by reflecting the light with a mirror. The latter methods were usually employed alternately.

The first few patients of the author were afebrile cases with only incipient or moderately advanced pulmonary involvement. Later, however, the cases were unselected. Many patients were exposed to the light for the relief of their dysphagia only. No general measures against tuberculosis were employed, nor in cases of laryngeal involvement, was silence insisted on.

On May 2, 1924, the first statistical figures were published classifying the results in 164 unselected cases.

	Cases	Per Cent
Locally healed	46	28
Locally improved	32	20
	78	48
Unchanged: treatment discontinued	20	12
Condition worse	24	14
Treated for dysphagia	42	26
	164	100

The therapeutic effect of the light is strictly local, leaving a distinct line of demarcation between irradiated and nonexposed areas. After a ten minute exposure on mucous membrane the subjective and objective effects consist of a slight feeling of a foreign body, moderate redness covered with a grayish haze (fibrinous exudate). Necrotic surface of granulations and ulcers are then cast off, leaving a less moist and smoother surface which soon epithelializes under further irradiation. A complete restitutio ad integrum results if the ulcer is shallow, large ulcers heal with a definite defect in substance. The scar resulting from heliotherapy is dense, white and tendinous, unlike the delicate and translucent opacity on spontaneous healing. Vesiculation or necrosis has never occurred with the light dose as practiced. Tolerance to the same dosage is soon established and no reaction occurs after the exposure.

The light possesses a valuable analgesic effect. In forty-four cases of dysphagia, twenty-five were completely relieved of the pain, eleven were temporarily improved, and eight remained uninfluenced. An early disappearance of the aphonia too was noted, but this was no indicator of the local improvement in the larynx, for often the pathologic picture remained unchanged while the speech became clearer.

As to the type of the lesion, the infiltrations and granulations responded most satisfactorily. Among the unimproved cases are counted mostly the ulcerative type. Ulcers of the tongue, however, responded much better than on the buccal mucosa or in the larynx.

Among the factors determining the prognosis in this method of heliotherapy, Wessely mentions (1) degree of pulmonary involvement, (2) temperature curve, (3) general resistance, (4) body weight curve. A course of treatments extending from one month to a year are necessary, rarely has a shorter period been found to be effective. Prognostically, too, the temperature curve was more important than the pulmonary involvement, only five febrile patients and twenty-one subfebrile of the total seventy-eight were improved. Increase in weight coincided in two thirds of the cases with the local improvement.

No general therapeutic effect of the light could be demonstrated; if this was the fact, then neighboring or even distant lesions (nonirradiated) should have shown improvement. Not in one instance did this manifestation occur; on the contrary, even new lesions arose after a successful healing at one site.

GLOWACKI, Detroit.

FROM THE PROCEEDINGS OF THE GERMAN OTOLARYNGOLOGICAL SOCIETY, 1925

POSTEMBRYONAL DEVELOPMENT OF THE HUMAN BULBUS OLFACTORIUS. WEISS-FLORENTIN and BRUNNER, Ztschr. f. Hals-, Nasen- u. Ohrenh (supp.) **12**: *367*, 1925.

At birth, bulbus olfactorius is anatomically fully developed, although the layers are not all well differentiated. Retrogressive changes occur later in the mitral cells and ventricle rests. The retrogressive changes in the mitral cells are probably dependent on similar changes in the olfactory mucosa. The cause of changes in the ventricle rests is unknown, as is disappearance of the Koerner cell layer of the cerebellum in later life.

CLEFT PALATE SUTURE AND PLASTIC OPERATION. HALLE, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:377, 1925.

Halle calls attention to the frequent poor functional results, and advises local anesthesia and morphine in all subjects. He uses Dieffenbach's incision along the alveolar margin, which is prolonged backward around the back of the last molar and down to the arcus palatoglossus at fold behind last mandibular molar. The palatal artery is avoided if possible. If cut, a tamponade is used until collateral circulation is established. Halle then dissects up the soft parts and tamponades; then he splits the soft parts horizontally along the medial defect, with a thin knife bent on the flat, sewing the two upper layers together with catgut, the two lower with silk or aluminum bronze wire or equisetin. He uses a celluloid prosthesis over the hard palate to protect the soft parts and suture line from tongue pressure during swallowing (it must be specially mounted on a "silberschiene" in toothless infants), under which a light layer of iodoform gauze is used for padding.

In dissecting up the soft parts, Halle keeps close to the bone, so as to get behind the superior constrictor. The area of uncut mucosa behind the incisors left by the primary incision is cut a little each day, as permitted by the vitality of the flap. When completely severed, the soft parts are mobilized backward. If the mobilization permits, the posterior part of the incision is sutured back so that the anterior part just covers the bony defect. If necessary, it is held forward by a suture carried through between the incisors. If the soft parts are insufficient at the back, tamponade and granulation is depended on instead of suture.

From 1.5 to 2 cm. of soft palate displacement backward is gained by this method, with wonderful results in speech. If the bony defect begins far forward, a secondary plastic operation may be made by a Y shaped flap, as the mucosa rebuilds in several months. The entire operation may be performed in one sitting, but is more safely done in two or more stages to give opportunity for the blood supply to become renewed.

Various other plastic operations for palatal defect repair are described, notably a pedicled flap from the skin of the face in the nasolabial region, and from the arm, combined with prostheses.

The article, even with its dozen excellent illustrations, still leaves one wishing for more details. In the discussion, it transpired that Halle awaits the first dentition for the palatal repair, but repairs the hare lip early.

NASAL ACCESSORY SINUS INFLAMMATION IN SUCKLINGS. BLOHMKE, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:391 (Nov.) 1925.

The author describes a violent infection invading the face of infants, with inflammatory edema, chemosis, exophthalmos, with or without subperiosteal abscess. There is swelling of the soft tissues covering the superior maxillary wall, especially in the nasolabial region and inner canthus of the eye. The discharge from the affected side of nose is free and purulent, and there is a phlegmonous swelling of the soft parts over hard palate and alveolar process.

The process frequently results in an abscess, which may invade the frontal lobe of the brain, the anterior tip of the temporal lobe via the orbital fissure, or the sphenopalatine recess, or break outward through the cheek, or sequestrate bone and unerupted teeth, with profound sepsis and usually with a fatal ending. This condition has usually been ascribed to osteomyelitis due to mouth infection. Blohmke describes five cases, including two necropsies, and concludes that the origin of the infection is in nasal accessory sinuses, ethmoid or antrum, with secondary invasion of the bone, and advises early, wide external drainage of the primary focus.

EXPLANATION OF THE CHARACTERISTIC PAIN IN FRONTAL SINUSITIS. SCHEIBE, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:400, 1925.

The drainage differs from that of the other sinuses in that it is at the lowest point in the upright position, and is a canal instead of a window. In the horizontal position, the secretion accumulates in the dependent portion, leaving the opening free. When the upright position is assumed, the secretion blocks the opening and prevents aeration; absorption of air follows, but instead of hydrops ex vacuo there is increased purulent secretion from the inflamed mucosa, with increased pressure. This process takes little time, and explains the onset of pain a few hours after getting up, and its relief after drainage and during the night.

The author suggests further roentgenographic study at different hours through the day to study the phenomena of fluid level, and recommends gradual erection of the head in ambulatory patients, and the constant horizontal position for bed patients.

EXTERNAL FRONTAL SINUS OPERATION. LAVAL, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:404, 1925.

The incision is made after the method of Killian, but only to the middle of the eyebrow. An hourglass shaped piece of bone from nasal process of the frontal, the front process of the maxillary, about 30 mm. long, 14 mm. wide below, 8 mm. above, in the frontal eminence are removed, giving a good view into the sinus and front part of the nose. The roof of the orbit, lamina papyracea and lacrimal bone are not injured, nor is most of sinus lining.

Enlargement of the nasofrontal duct is made by removal of anterior ethmoid cells, superior nasal spine and other obstructions, but the concha mediums

and the nasal mucosa are retained, using the mucosa of the middle meatus and the Thiersch grafts from the lower lip to cover the defects. Two or three skin sutures are used, the lowest also holding the flap of the mucosa from the middle meatus. No drain or tamponade is used; adhesive plaster dressing is favored. Afterward, epinephrin-cocain spray for a few days to facilitate drainage is used. The author claims excellent functional and cosmetic results.

THE GENESIS OF THE OTOLITHS. HERZOG, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:413, 1925.

The investigations were made on chick embryos from the fourth to twenty-first day of incubation at twenty-four hour intervals. On the fifth day, the primitive otic vesicle fold (the epithelium) has already begun to differentiate itself, and over this well defined cell complex an irregular structure of tangled threads lies like a veil. The next day this deposit becomes larger and denser, its connection with the epithelium appearing loose and scant. After the seventh day, the crystals are definitely present. Professor Sander, minerologist, identifies the crystals as calcium carbonate in the form known as aragonit, which is supported by microchemical tests. A discussion of the probable physiochemistry of the crystals follows. The article is well illustrated and should be consulted in the original for details.

CONTRIBUTION TO THE EVOLUTION OF THE EAR. JUNG, Ztschr. f. Hals-, Nasen- u. Ohrenh. (supp.) **12**:423 (Nov.) 1925.

Jung reports, with illustrations, the successful transplantation of the otic vesicle of the larval frog into the orbital cavity, with the further development in its new location of capsule cartilage, semicircular canal and macula.

LEWY, Chicago.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Dec. 7, 1925

HARRY L. POLLOCK, M.D., *in the Chair*

OSTEOMYELITIS OF THE SUPERIOR MAXILLARY BONE, ORBITAL CELLULITIS AND ABSCESS. Presented by DR. C. F. YERGER.

This patient was admitted to the Cook County Hospital, Department of Ophthalmology, on Dr. George Suker's service, at the age of 17 days, with the diagnosis of a retrobulbar tumor of congenital origin.

The mother stated that the birth was normal, and that the infant had been in good health until four days before presentation, when she noted that the right eye was swollen and pushed forward. This became worse in the course of a few hours, and by the following day the proptosis had become still more marked and was associated with a discharge of pus from the right nostril.

When the baby was 14 days old, the mother noted that it had a canker sore in the mouth. A history of trauma, of diseased or of dirty nipples or of the presence of a breast abscess could be excluded, although the mother developed an abscess of the breast, subsequent to the time it was discovered that the baby had a discharge of pus from the mouth, when 18 days old. The mother's breast was infected by the baby and not vice versa.

Examination showed a very marked proptosis of the right eye with conjunctival injection but no discharge. Transillumination of the eye was normal. There was a profuse discharge of pus from the right nostril and mouth. There were two fistulas along the right alveolar ridge at the level of the first and second molars which exuded pus. Pressure over the right cheek increased the drainage from these openings and from the right nostril and also exaggerated the proptosis, showing that a communication existed between these regions. The right side of the hard palate was swollen and flush with the alveolar ridge, obliterating the normal concavity of the palatal arch as far as the median line.

Dr. Suker diagnosed the case as one of suppurative nasal sinus disease. Numerous attempts at roentgenography failed, due to the baby moving.

The fistulas along the alveolar ridge were probed but did not seem to connect with the orbit. After the extraction of one of the unerupted teeth which presented at the orifice, a probe was readily passed from the alveolar orifice to the orbit. The temperature was septic during the baby's first two weeks in the hospital, the purulent discharge from the nose and mouth continued and the proptosis was unchanged. The treatment consisted of frequent cleansing of the discharge from the nose and mouth, and the baby was taken off the breast and the bottle substituted.

In the beginning of the third week, hoping to increase drainage from the orbit, the fistulas in the alveolar process were curetted and extended upward toward the floor of the orbit. In doing this several tooth germs were removed. The proptosis gradually became less marked, but was still somewhat in evidence after a month's residence in the hospital.

During the height of the compression on the eyeball by the orbital cellulitis and the presence of a most marked proptosis, a choked disk resulted which later was followed by atrophy of the optic nerve (Suker).

At the time of presentation, three months after the baby entered the hospital and two months after she was discharged, there was present a slight amount of proptosis and a purulent nasal discharge occasionally. Another attempt was made to obtain suitable roentgenograms, but Dr. Matthews of the roentgenological department was unable to state definitely whether or not an osteomyelitis of the superior maxillary bone was present, but did exclude the nasal sinuses as a cause of the disease.

PROGRESSIVE OSTEOMYELITIS OF THE FRONTAL BONE. Presented by DR. YERGER.

A man, aged 51, entered the Oto-Laryngological Department of Cook County Hospital on Sept. 18, 1924.

Six months previously the patient developed an acute swelling over both maxillary and frontal regions, which was followed by a fistula on each side of the bridge of the nose. One month later an abscess appeared over the left supraorbital region, followed after one week by an abscess over the right supraorbital region, both of which opened spontaneously and discharged pus. He had a positive Wassermann reaction and had received 14 injections of arsphenamine and a course of mercurial inunctions. He had had a saddle nose deformity for twenty-four years, following a nasal operation.

Examination showed hyperemia and induration over both maxillary and frontal regions with discharging fistulas, one on each side of the bridge of the nose and in each supraorbital region. The discharge was a fetid creamy pus. The right eyelids were swollen and the eye was closed. The blood Wassermann reaction was negative.

Diagnosis: Chronic osteomyelitis of the frontal bone due to frontal empyema or syphilis, or both.

Operation: A bilateral supraorbital incision was made, connecting over the bridge of the nose and extending laterally upward toward the vertex. Necrotic portions of the frontal, nasal and vomer bones were removed, and a modified bilateral Killian frontal sinus operation was performed, with drainage of extradural abscess. A pachymeningitis externa was present and the dura was covered with a thick layer of edematous granulations, which were removed.

Ten days later, a fluctuant swelling presented over the upper part of the forehead, the sinus over the left midfrontal region opened and 1 ounce of thick creamy pus was evacuated. Twenty days after operation a sequestrectomy was performed because of positive roentgenographic evidence of bone sequestrums. The old incisions were reopened and extended upward toward the vertex, and several sequestrums and granulations were removed.

Bacteriologic examination showed that the pus obtained at operation contained gram-positive diplococci in chains.

Pathologic Examination: "The two pieces of frontal bone removed at operation were 7 by 5 and 4 by 5 cm., the outer surface was spongy, worm eaten and covered by greenish yellow purulent material. The bone substance was dense and not at all spongy, as suggested by the outer surface, and cannot be broken. Pathologic Diagnosis: Chronic osteomyelitis, with caries and sclerosis of the frontal bone."

Surgical Diagnosis: Progressive osteomyelitis of the frontal bone with extensive syphilitic necrosis of the frontal, nasal and vomer bones and the cartilage of the nasal septum; extradural abscess and pachymeningitis externa.

Following the second sequestrectomy, the patient made an uneventful recovery and had remained well for fifteen months.

PROGRESSIVE OSTEOMYELITIS OF THE FRONTAL BONE. Presented by DR. YERGER.

The third case was a boy, aged 12, who entered the Oto-Laryngological Department of Cook County Hospital on Feb. 12, 1924.

Five days previously the patient had a right external frontal sinus operation at another hospital. For four days following the operation he improved, but on the fifth day became delirious.

Examination showed a poorly nourished boy in a delirious and stuporous condition, from which he could be aroused into consciousness for a few minutes and would then relapse into his former state. There was present a soft edema involving the scalp over the frontal and parietal areas extending down to the zygoma and involving both eyelids. There was proptosis of both eyes and bilateral chemosis. Leukocyte count was 27,000; spinal fluid examination showed 52 cells, mostly lymphocytes.

Diagnosis: Acute frontal sinus empyema, orbital cellulitis, cellulitis of the scalp and recent operation on the right frontal sinus. A diagnosis of acute toxic meningo-encephalitis was made on the spinal fluid findings and his stuporous condition, together with the absence of positive findings in favor of meningitis or brain abscess.

Operation: Incision along both eyebrows and across the glabella. The anterior plate of the right frontal sinus had been removed and the sinus was found full of thick creamy pus. The anterior plate of the left frontal sinus was removed and it likewise was found full of pus. Both nasofrontal ducts were enlarged by breaking down the anterior ethmoids, and rubber drainage tubes were inserted. The wound was left widely open with gauze packing.

Cultures of the pus showed *Staphylococcus aureus.*

The following day the boy was wildly delirious and had an axillary temperature of 101 F. Three days later his sensorium became clear and his cerebration good. Nine days after operation he developed an abscess in the right pectoral region, which was opened and drained. He continued to have an elevation of temperature of 1, 2, or 3 degrees for a period of twenty days following operation. After a residence of two months in the hospital he was discharged and treated in the outpatient department, but was re-admitted two months later on account of continued suppuration and fistula formation due to the presence of sequestrums.

A sequestrectomy was performed, the old incision was reopened, the skin flap being carefully dissected from the dura. A small cavity containing pus was found on the right side external to the dura. The two fistulas in the right and left supraorbital regions were curetted free from granulations, two large bone sequestrums were removed and the wound packed with gauze.

The discharge of pus continued from the edge of the wound in the midline over the glabella and through a fistulous opening in the midline within the hairy scalp. Pressure made on the superior swelling caused pus to flow from the inferior fistula. A roentgenogram showed the presence of sequestrums, necessitating a second sequestrectomy four months after the first.

At this operation two thin bony sequestrums 1 by 3 cm. were removed. The superior fistula communicated with a circumscribed osteomyelitic area 2 by 2 cm., which was filled with granulations. The carious bone was thoroughly removed. Normal bone separated the interval between the area of bone necrosis and the previously operated area of osteomyelitis to the extent of 4 cm., proving that the process in this area at least was due to a localized hematogenous infection and not to involvement by contiguity as had occurred in the previously operated area. The operative technic differed from the two previous operations

in that a horseshoe flap with the base down and its convexity situated well up within the hair line of the forehead was made, in order to be able to follow the osteomyelitic process into the vertex region. The inner surface of the flap and the two fistulous openings contained much edematous granulation, which was removed. The pericranium was sutured with catgut and the skin was closed with silkworm gut. Gauze drainage was provided for through the two fistulous openings, which were enlarged.

A roentgenogram taken one month later showed shadows suggestive of sequestrums in the frontal region at the hair border and above the roof of the nose. Six weeks later two sequestrums the size of the little finger were removed through the superior fistula, from which pus had been discharging. Subsequently, there had been no recurrence of sequestration and the patient had remained well for twenty-two months.

DISCUSSION

Dr. Otto Stein, discussing the first case, said that he saw an almost identical one in a child 2 weeks old. Following a circumcision by a general surgeon, the child developed a generalized infection, with a discharge of pus from the right nostril and numerous fistulas in the superior maxilla on the right side. They finally succeeded in clearing up the infection.

Dr. George W. Boot had seen several cases similar to the first, but most of them had followed infection from the ethmoid instead of the maxillary sinus. One patient was a young man of about 20, who had a sore throat and some rash development. Later, he developed a great deal of swelling of the alveolar process and discharge from the right maxillary sinus. He was sent to the hospital and the sinus was opened. One tooth was very loose and was removed and the infection cleared up.

Dr. Boot thought the last two cases were entirely different in type, and that Dr. Yerger should be congratulated on the recovery, particularly of the boy.

Dr. Joseph C. Beck thought the important thing in the first case was the future development, because there would be a hemifacial atrophy, stopping development. The dental process would have to be carefully considered, as the teeth had been lost through the operation. In a similar case under his care, the patient was 2 months old and as an end-result retraction of the eye occurred and quite a bad deformity resulted. He believed most of the cases were embolic.

Dr. Harry L. Pollock, discussing the first case, called attention to the controversy which had recently appeared in the *Zeitschrift für Ohrenheilkunde*. There had been much discussion between Paunz of Budapest and Korner of Rostock as to the etiology in these cases. Paunz claimed they were all due directly to antrum infection, while Korner claimed they were primarily due to infection of unerupted teeth, and cited several cases in which the antrum was perfectly normal.

Discussing the last two cases, Dr. Pollock mentioned the case of a woman who was admitted to the North Chicago Hospital the day before, with a history of pain over the right eye of six months' duration. She had received local treatment from her home physician until about one month before, at which time the eye began to swell and great quantities of pus came from the nose. She was treated by suction and warm applications until the swelling of the eyelid became worse. On examination, they found the eyelid greatly swollen and edematous. The patient was presbyopic but vision was fairly good. They

aspirated the pus from the nose for culture. The roentgenogram showed osteomyelitis of the entire frontal bone on both sides, and the frontal sinuses were practically obliterated. Operation had been performed that morning. There was an area the size of half a dollar in which the dura was exposed filled with granulation tissue, and above this area a sequestrum which was freely movable. There was no intracranial involvement at the time of operation, but with the large dural exposure they had great fear of mortality because the disease was progressing. They had put in drains and left the wound open. The infection could have occurred from the frontal sinus, but they believed it was on a syphilitic basis, although they had not yet received the report on the Wassermann test. They thought the infection had probably originated in the ethmoid and extended upward. The acute infection was of four weeks duration.

(A later report from microscopic specimen proved it to be a squamous cell carcinoma. The Wassermann reaction was negative.)

Dr. Robert H. Good related a case of necrosis of the frontal bone, with a large swollen mass in the center of the forehead, which had been present for six months. It changed in size occasionally and pus discharged from the nose. He performed an intranasal frontal sinus operation, and then could squeeze the mass and pus would come down into the sinus and then into the nose. He instructed the patient to exert pressure on the mass by pressing the forehead to evacuate the pus, which he did for several months, but, as no good resulted, they decided to operate more radically. At operation they found a conical shaped, perfectly green, necrosed area in the center of the forehead. This entire area was removed to the dura, but the patient afterward developed osteomyelitis and died. Dr. Good thought they should have drained the necrosed area instead of removing the bone.

Dr. Charles H. Long congratulated Dr. Yerger and complimented him on his courage in following up the cases. In London, a number of years ago, Dr. Long saw several cases of osteomyelitis, and their treatment was so unsuccessful that he made no attempt to follow them up. Their mortality was almost 100 per cent, no matter what the cause.

Dr. C. F. Yerger (closing) said he was aided in his diagnosis in the first case by an article which Dr. Posey of Philadelphia published in the *Journal of the American Medical Association* in 1912. In that article he stated that in infants under 2 years of age, osteomyelitis of the superior maxillary bone is the most common cause of orbital cellulitis, or orbital abscess, and reported two cases. Skillern claims that in infants there is no sinus of any importance, but that those that are present may be the starting point of an infection such as this, perhaps during delivery, or some infection soon after birth. He believes, however, that most of them are due to osteomyelitis rather than to sinus trouble. Posey stressed the point that dirty nipples or a breast infection of the mother may infect the child. In the case Dr. Yerger presented after the baby developed the mouth trouble, the mother developed a breast abscess as a result of infection of her nipple from the pus from the baby's mouth. As the sinus is not developed in infants, the bone must be considered as being involved.

Dr. Yerger said the last two cases represented his entire experience with osteomyelitis of the frontal bone, and there were no mortalities. There were two ways of looking at the problem from the standpoint of surgical treatment; one the conservative and the other the radical. He believed one should use a great deal of discretion and rely a great deal on frequent roentgenograms to see whether there was any evidence of bone necrosis. The treatment which is generally advocated is very radical. Dr. Yerger did not think it should be

treated so radically; in the beginning, when there is pus the abscess should be incised and drained, just as an abscess elsewhere. When the infection is subperiosteal or extradural, this must be taken care of, but he thought it a mistake to be too energetic in the removal of the doubtfully necrotic bone. Surgery should be limited to removal of the sequestrums, and patients should be followed up for from six months to a year by roentgenographic observation. If there was continued pus and the presence of sequestrums, the condition should be cared for as it occurred.

RADIUM IN THE TREATMENT OF CARCINOMA OF THE TONSIL AND LARYNX. Presented by DR. SAMUEL SALINGER.

CASE 1.—An engineer, aged 58, was first seen on Jan. 22, 1925. He had complained of hoarseness for over a year and of dyspnea for several weeks. Syphilis and tuberculosis were ruled out.

Examination showed a large lobulated irregular mass arising from the right side of the glottis, projecting upward above the level of the ventricular bands and almost completely covering both vocal cords so that only the posterior portion of the glottis was free. There apparently was no involvement of the arytenoid area.

A tracheotomy was performed, following which a section was removed by suspension laryngoscopy, and the growth was implanted with eight radon seeds, totalling about 4 millicuries. During the next few weeks there was considerable reaction with some sloughing. The patient received three external radium applications over the larynx. On April 7, under suspension laryngoscopy, the entire growth was removed and the base was implanted with six radon seeds totalling 3 millicuries. Histologic examination of the mass showed a carcinoma. Considerable sloughing followed, and the patient was annoyed by a persistent cough. He received one more external radium treatment. The slough gradually disappeared, and on September 7 a whitish mass was seen below the glottis which was easily removed under local anesthesia, using the Haslinger, which proved to be a portion of the cricoid cartilage.

The patient had since gained 25 pounds and was in perfect health. His voice was hoarse but plainly audible. Examination showed that the greater part of both vocal cords were gone, and there was cicatrization below this point on the anterior wall of the trachea. There was the likelihood of a web formation at the point at which the cricoid was lost, and they were watching for this development.

CASE 2.—A night watchman, aged 59, was first seen on April 30, 1924, complaining of pain and swelling in the right side of the throat. Eighteen months previously he had had a fall, breaking off the stem of a clay pipe he was smoking, which injured the back of his throat. Three months later pain and swelling appeared. The condition was then diagnosed as syphilis and several treatments were given.

Examination on April 30, 1924, showed a fungating, cauliflower, infiltrating mass involving the right tonsil, the anterior pillar and base of the tongue. The right deep cervical glands were enlarged, dense and fixed. The Wassermann reaction was negative. Under local anesthesia twenty radon seeds, totalling 10 millicuries, were planted into the mass. The reaction which followed was very painful. The patient suffered a great deal in swallowing and lost considerable weight. The tongue was completely healed within ninety days, but the tonsillar area still presented some sloughing. At the end of six months this area also was healed, presenting a smooth white scar involving the whole

tonsil region and extending through the anterior pillar, which was perforated up to the margin of the ascending ramus of the mandible. On account of discomfort resulting from food accumulating in this perforation, the strand of pillar was later removed. The neck had been entirely free from adenopathy for nearly a year and the throat presented the same appearance as it did when it first healed.

These cases illustrated what may be done with radium emanation. The principle of the treatment is to so distribute the agent within the growth as to irradiate thoroughly all parts of it with a minimum amount of damage to the neighboring healthy tissue. Failure results from the difficulty in accurately mapping out the extent of the lesion, and from the general decline due to the dysphagia and other effects of the reaction. The problem is particularly difficult in the larynx because of the perichondritis which ensues with the danger of necrosis of the cartilages. The best results thus far obtained in the larynx have been through the use of small intralaryngeal doses, supported by heavier irradiation from the outside.

INTRANASAL SQUAMOUS CELL CARCINOMA (BILATERAL). Presented by DR. WALTHER H. THEOBALD.

This case was of interest because of its rareness, its bilateral location, and especially because of its marked response to radium treatment.

The patient, aged 75, came under Dr. Theobald's care July 29, 1925, complaining of complete nasal obstruction and a mucopurulent discharge, which drooled continuously because of inability to blow the nose. This had been present for a period of about four months, and was first noticed after a severe attack of influenza, complicated with double otitis media lasting about two weeks. He stated that he had suffered from "nasal catarrh" prior to this trouble, for which he had never sought relief. He also complained of pain over the top of the head, inefficiency at his work and a loss in weight amounting to 20 pounds.

On inspection externally, the nose appeared swollen over the bridge which was continuous with a puffiness below the eyes. Lacrimation was present and his voice had the characteristic lack of resonance found in nasal stoppage.

Anterior rhinoscopy revealed a large papillomatous, pale red mass completely filling both nostrils. This mass had the appearance of granulation tissue intermingled with nasal popypi, and seemed to be intimately connected with the lateral wall of the nose as well as the septum. It was covered with a mucopurulent secretion, was soft and spongy, and bled rather freely when probed with an applicator. No ulceration was present. It was impossible to introduce the nasopharyngoscope on account of the bleeding, so that the origin and exact distribution of the tumor could not be determined. Cocaine had no effect on reducing its size. There were no enlarged cervical or maxillary glands palpable.

Laboratory examinations and the pathologic report are as follows: "Urine and blood count negative. Wassermann test negative. The roentgen ray showed appreciable opacity in both maxillary sinuses which was more pronounced in the right. The right frontal sinus also was somewhat opaque and there was a question of certain ethmoidal cells. The left frontal sinus seemed clear. The sphenoid sinus looked clear. There was nothing about the appearance of the sinuses that would argue toward malignancy."

On August 3, the patient entered St. Luke's Hospital for the purpose of making a histologic study of the tissue. Suitable specimens were removed

from both sides of the nose under cocaine anesthesia. The hemorrhage was brisk, and gauze packing in the nose was necessary for the following thirty-six hours.

The report of both specimens showed squamous cell carcinoma. It was decided that the condition was inoperable, because the growth involved both nasal cavities and extended more or less into the ethmoid and maxillary sinuses. Furthermore, the patient's weakened condition and his age contra-indicated any radical procedure. Therefore, destruction of the growth by radium was considered the best means of treatment.

On August 11, radium was placed in each nostril for six hours, the dosage being 300 milligram hours. The radium tube was forced well into the growth on each side. Considerable reaction followed, swelling of the face, headache for several days and profound weakness.

On August 24, 50 mg. of radium was placed in the right side and 25 mg. in the left side for six hours, a dosage of 450 milligram hours. The reaction was not as severe and there was a marked diminution in the size of the growth.

On November 11, 25 mg. of radium was placed in each side for six hours. The total dosage to date had been 1,050 milligram hours. Screening used was 0.5 silver and 0.8 rubber.

The condition of the patient when presented was greatly improved. He attended his office daily, has gained 15 pounds in weight, complained of no headache and breathed freely through his nose. Examination showed fibrous tissue and a firm, rather pale mucosa on both sides. There was plenty of room for breathing and an adhesion of the inferior turbinate to the septum on the right side.

DISCUSSION

DR. NORVAL H. PIERCE recalled three cases that had come to his attention since the war. Two of them involved the ethmoid labyrinth, one the ethmoid on one side and the antrum. The first patient was a man, aged about 40, a bank employe, well nourished, who complained of stoppage of one side of his nose and discharge of mucopus, dull, heavy pain in the right side of his head and in the eye. Rhinoscopy disclosed a growth occupying the entire right nasal chamber down to the middle of the upper portion of the inferior turbinate body. This was polypoid tissue that seemed to be undergoing fibrous change, and between the lobules granulation tissue could be seen. He thought the process was an ethmoid polypoid degeneration. He removed the growth and performed a complete exenteration of the anterior and posterior cells of the labyrinth. The tissue was sent to the laboratory and examined by competent men, who reported carcinoma. The patient has been under observation since then and there has been no sign of recurrence in two or three years. No radium therapy was employed, and the operation was simply the ordinary intranasal removal of such a growth.

The second case occurred in a man in the seventies, who had a bulging antral wall, a slight displacement of the eye upward and outward, a quantity of very vile smelling pus and a mass occupying the entire left side of the nose. There was a suspicion of carcinoma. The growth was removed intranasally, the antrum was opened and a great quantity of foul smelling material was discharged, which contained cheesy material. The diagnosis from the pathologic laboratory was carcinoma. The patient was treated with three or four implantations of 50 milligrams of radium in the antrum, but not in the nose. There had been no recurrence and the patient apparently was well.

The third case resembled the first. There was a diagnosis of carcinoma from the pathologic laboratory. The patient had received no radium therapy, but had made an apparently permanent recovery.

Dr. Pierce thought two inferences could be drawn from these cases and that of Dr. Theobald: Inflammatory processes in the mucosa of the nasal accessory sinus may cause changes in the arrangement of epithelium which are similar to those found in carcinoma; or else the carcinomas in this region are exceedingly benign, and while carcinomatous morphologically, possess little or no malignancy.

Dr. Joseph C. Beck thought the point that there are histologic changes which are imitated by artefacts was very important, and this occurs not only in grouping but in section. The all important point was that the diagnosis of carcinoma should include a statement of the type of cell. There are at least four clearly differentiated types, and the prickle-celled, the basal-celled, the squamous-celled and the adeno-carcinoma all respond differently to roentgen ray and radium. The change in the technic of treatment has been pronounced, and men who have studied many of these patients from the standpoint of dosage and technic have found that many mistakes were made in the early days of this treatment. The present-day ampules are considered much more efficacious than the needle or external application of screened tubes. While there is danger from the cicatrization of the cartilage, Dr. Beck thought everyone would agree that this is better than having to perform a laryngectomy, no matter how successful the operation may be.

Dr. George W. Boot stated that Dr. Freer had treated two cases for him, with apparent cure, but both the patients had died later from recurrence. One patient who was treated by Dr. Simpson was still living, but in that case he believed there was a mistake in the diagnosis and that it was not a case of carcinoma.

Dr. Salinger (closing) said that he had seen the patients referred to by Dr. Boot, who were treated by Dr. Freer and apparently cured, on several occasions. The only explanation was that the initial dose was so large that there was a subsequent breaking down of the tissues and the patients died of perichondritis and infection. One millicurie of radium emanation buried in the tissues will exhaust itself in thirty days, yielding a total of 133 millicurie hours. The principle of the treatment is to distribute the seeds in the infected tissue, figuring that the ampule has an active radius of about 1 cm. in every direction.

Dr. Walter H. Theobald (closing) stated that the pathologic report in his case came from Dr. Hirsch of St. Luke's Hospital, and the tumor had all the features of malignancy. According to LeCount, many such cases of carcinoma in the nose are amenable to radium treatment. No operating was performed, a specimen being removed from each side of the nose with as little trauma as possible. Whether or not the growth was malignant, the growth had disappeared, and the patient had been able to breathe freely since the radium was used.

Parotid Fistula. Presented by Dr. George W. Boot.

This patient had been shot in the cheek and a parotid fistula followed. The area had been curetted, roentgen ray and radium therapy applied, without effect. Dr. Boot eventually took a heavy, braided silk thread and thrust it through

the cheek and left it in for thirteen weeks to establish a new duct. On removal of the thread the fistula closed, and had remained so since. The patient was now under treatment for repair of the scar.

Dr. Boot had a similar case in a child, following a mastoid operation by another physician, with a fistula behind the ear, which persisted for a year.

DISCUSSION

Dr. Charles H. Long recalled the case of a woman who was choked by her husband, causing traumatism of the left parotid gland. She had some paresis, great swelling and pain, and along the lower angle of the inferior maxillary a fluctuating spot was found which was opened. By keeping this open and clean, the fistula healed in about two years, with little scarring or deformity. In his opinion it was better to let the parotid gland get well by itself, if possible.

Dr. George W. Boot (closing) said he did not present the case to demonstrate a new method of treatment, but because the treatment was old and still good.

Suppurative Otitis Media. Presented by Dr. Noah Schoolmann.

This patient had suppurative otitis media for fifteen years, and came to him complaining of occasional vertigo. Examination of the ear revealed little except a small crust. On removal of the crust there was a little pus on the inner side and some glistening material toward the attic which, when removed, showed an opening into the attic and the attic filled with cholesteatoma. This work made the patient dizzy, and on trying the turning test he found nystagmus with the slow movement to the opposite side. He considered the case rather unusual because of the problems involved in the treatment. All that could be seen was the perforation into the attic, but he was suspicious of sequestrums in the labyrinth. The patient was in good health and attended to business in the intervals between attacks. He had no spontaneous nystagmus.

Lung Abscess. Presented by Dr. Edwin McGinnis (with series of lantern slides demonstrating lung abscess from various causes).

Case 1.—A boy, aged 9, with lung abscess caused by the inhalation of a piece of grass with which he had been picking his teeth. The condition reacted favorably to bronchoscopic aspiration and neo-arsphenamine.

Case 2.—A girl, aged 6, had a right lower lobe lung abscess following tonsillectomy. This was cured by two bronchoscopic aspirations and four injections of neo-arsphenamine.

Case 3.—This was a right lower lobe abscess following tonsillectomy, but was not caused by the anerobic bacteria. This reacted very well to two bronchoscopic aspirations.

Case 4.—A girl, aged 6, had three lung abscesses following tonsillectomy. One was in the left upper lobe, one was in the right upper lobe, and one was in the right lower lobe. These cleared up with neo-arsphenamine and bronchoscopic aspiration.

Case 5.—This case was one of massive collapse of the left lung, following the aspiration of a piece of peanut candy. Following one bronchoscopic aspiration the lung started to expand, and it was only necessary to aspirate once more to accomplish a complete filling out of the lung.

DISCUSSION

Dr. George W. Boot objected to the nomenclature. In his opinion, unless the lung tissue is broken down it is not lung abscess, but suppurative bronchitis, peribronchitis and pneumonia.

Dr. Laurence H. Mayers said that, in his opinion, it would be as easy to differentiate between a yell and a scream as between bronchial pneumonia and lung abscess at such an early stage of the disease. If the roentgenograms Dr. McGinnis had shown were lung abscesses, he would have to explain more in detail how he had arrived at the diagnosis, as Dr. Mayers knew of no way, clinically or by the roentgen ray, that lung abscesses can be diagnosed at such an early stage of the disease.

Dr. Edwin McGinnis (closing) agreed with Dr. Boot that in the early stages the conditions are not lung abscess, but are inflammations of the mucous membrane. Anerobic infections, if permitted to go on, cause breaking down of the lung tissues, and the old picture of cavity with foul smelling sputum and all the other characteristic findings will be present. He believed that bronchoscopy would help these cases materially. A few years ago, no one thought of using the bronchoscope or arsphenamine in these cases, but the bronchoscopic aspiration has worked well in many subjects, and if they can be treated early it will prevent the cavity formation. In a patient who had been operated on externally at the Presbyterian Hospital, he found five or six bronchi spilling pus out into the main bronchus, which the patient had to cough up. Early bronchoscopic aspiration would have helped this patient.

Osteoma of the Sphenoid. Presented by Dr. Carl H. Christoph (with photographs).

A woman, aged 45, had consulted him complaining of periodic headaches of greater or lesser intensity, sometimes accompanied by nausea and occasionally by dimness of vision, for the past eight years. She had experienced an especially severe attack during the last five days, accompanied by diplopia and very poor vision in the left eye. One brother had died of brain tumor, but, aside from this, the personal and family history were negative. Examination showed the left eye turned in, and the patient was unable to move it outward, but motion was normal in other directions. Vision in the right eye was 10/10, in the left eye 2/10, but the patient stated that she had always had good vision in this eye. Examination of the nose showed the septum deviated to the left, but no pus or other pathologic changes were visible. The tonsils were small, submerged, and contained no pus on pressure. Transillumination was negative. The color fields showed a contraction especially for form, and somewhat less for green and red. Roentgen-ray examination showed a bony growth in the region of the sphenoid sinus, evidently originating from the septum, separating the sinuses and apparently intimately connected with the lateral wall of the sinus. The blood and spinal fluid Wassermann reactions were negative. A diagnosis of osteoma was made.

Under local anesthesia the posterior one-third of the septum, with the rostrum of the sphenoid and the entire anterior wall of the sphenoid sinus, was removed. Dental burrs and forceps made no impression on the tumor mass, which was like ivory in character. A few chips were removed by means of a chisel, and the Lincoln-Gardiner Laboratory reported them to be bone tissue. The growth was so intimately connected with the lateral and superior walls of the sinus that it was decided to leave it *in situ*, with the hope that

it would grow anteriorly. Three days after the operation the external paralysis and the headache disappeared and the vision in the left eye was 8/10. Several subsequent examinations have showed the color fields and vision to be normal and there has been no recurrence of the headaches.

DISCUSSION

Dr. Otto Stein considered this a very unusual case, and said he had not before heard of osteoma confined to the sphenoid sinus, but had seen them in the nose and antrum and frontal sinuses. He was curious to know how the diagnosis was established before operation. The photographs and the ophthalmoscopic examination suggested the findings in hypophyseal disease, particularly on looking at the lateral view of the sella where it encroached on the sphenoid sinus, but the operative findings proved the growth to be an osteoma.

Dr. Carl H. Christoph (closing) said the diagnosis was made chiefly by roentgen-ray examination, which showed a definite tumor in the region of the sinus, and chips removed from this mass were reported to be bone. The only condition it could have been confused with was exostosis, and he did not know how one could differentiate those two conditions preoperatively.

Ragweed of the Chicago Area. Presented by Dr. Alfred Lewy.

These specimens of ragweed were collected by Dr. Lewy near his home, among them the most prolific producers of hay-fever.

Three mounted specimens, the low ragweed (*Ambrosia artemisiefolia*), the giant ragweed (*Ambrosia trifida*), and the burweed marsh elder (*Iva xanthifolia*), represented the principal offenders in this region as the supposed cause of the autumnal type of hay-fever. They are common on all empty lots, along ditches, etc., and their pollen, which is very profuse and light, is wind-borne to enormous distances and great altitudes.

DISCUSSION

Dr. Edwin McGinnis was much interested in the presentation, for he has been investigating ragweed for some time. He agreed that such weeds are the predominant causes of hay-fever.

Dr. H. L. Huber thought that another one of the ragweed family should be included in this collection, the common cockle burr. It is spread widely enough to be of importance in some cases. Another ragweed, the *Ambrosia psilostachya*) or western ragweed is found in a few places. Dr. Lewy had included one of the newer ragweeds, the *Iva xanthifolia*, which has become very important in the Chicago territory recently, as it is invading Chicago from all sides and spreads very rapidly.

Dr. Alfred Lewy (closing) said that of course the cockle burr (*Xanthium Canadense*) is a closely related genus, but he did not think its pollen was of as great importance as the three mentioned. He was not aware that the western ragweed occurred in the Chicago area as mentioned by Dr. Huber. This presentation was not intended to cover all the pollen bearers concerned in autumnal hay-fever, but was merely for the benefit of those members who do not get out into the great outdoors much, and who might be interested in getting acquainted with the source of much trouble to some of their patients and to themselves.

CERVICAL EMPHYSEMA FOLLOWING TONSILLECTOMY. Presented by DR. AUSTIN A. HAYDEN.

This patient had recently had a tonsillectomy under general anesthesia. The patient was one of the resident staff at St. Joseph's Hospital, and the evening after the operation Dr. Hayden received a telephone message from one of the interns, stating that the patient had some air in his neck. On going to the hospital he found the neck somewhat swollen, and the patient had discovered crepitation on feeling his unshaven face. Dr. Hayden found the crepitation very distinct, questioned the patient carefully as to whether he had been coughing and was told that he had coughed a great deal in an effort to raise some dry mucus that had interfered with breathing. There was very little swelling in the throat and the mucus had been expelled. By means of the application of ice, and thoroughly expectant and confidence inspiring treatment the patient made an uneventful recovery.

Dr. Hayden thought that the question of air in the tissues following nose and throat operations was somewhat interesting. He cited the case of a clergyman who came to him a number of years ago to have his eustachian tubes inflated. He had done this a number of times but one day when he introduced the catheter the patient exclaimed, "Doctor, I am choking to death." His voice was perceptibly thickened, and on taking a tongue depressor and examining the back of his mouth, Dr. Hayden was amazed to see that the uvula was tremendously edematous and that there was a large amount of air underneath his superficial cervical fascia. Evidently the catheter had penetrated the membrane around the mouth of the tube and some air had been forced out, which rapidly spread all over his neck. That patient also made an uneventful recovery, but probably if any infectious material had been blown out, a Ludwig's angina would have followed.

The essential thing is to see that tonsillectomy patients do not cough violently or clear their throats following operation.

DISCUSSION

DR. ROBERT H. GOOD said he had had the same thing happen in the case of a woman under local anesthesia, with the same symptoms, and an uneventful recovery.

DR. HARRY L. POLLOCK said one of the most extensive cases that he had seen followed a tracheotomy, when the tissue was closed too tight around the tracheotomy tube. Within an hour the entire neck was full of air, but the only treatment necessary was to open one of the stitches. In another case a child had inhaled some small pieces of cork and the case was diagnosed as pneumonia, but emphysema was found above the clavicle. This was probably due to the forced breathing, for air could get in but none could get out. After the bronchus was opened and air by suction of thick mucus entered, the condition subsided very rapidly.

DR. AUSTIN A. HAYDEN (closing) cited another case seen a number of years ago. A woman called him by telephone and said that "her husband had blown his eye out when he was blowing his nose." The patient was the driver of a milk wagon, and, in unhitching his horse, he had received quite a severe blow on the nose as the horse turned his head to get rid of a fly. During the night he blew his nose quite forcibly and evidently some air entered the tissues and filled the entire area about the eye, because of a rupture of the mucous membrane.

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